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A SELECTED, ANNOTATED BIBLIOGRAPHY ON NATURAL HAZARDS.

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NATURAL HAZARDS

by

Anita Cochran

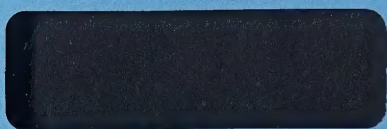
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Anita Cochran

September, 1972

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PREFACE

This paper is one in a series on research in progress in the field of human adjustments to natural hazards. It is intended that these papers will be used as working documents by the group of scholars directly involved in hazard research as well as inform a larger circle of interested persons. The series was started with funds granted by the U.S. National Science Foundation to the University of Colorado and Clark University but now is on a self-supporting basis. Authorship of papers is not necessarily confined to those working at these institutions.

Further information about the research program is available from the following:

Gilbert F. White
Institute of Behavioral Science
University of Colorado
Boulder, Colorado 80302
U.S.A.

Robert W. Kates
Graduate School of Geography
Clark University
Worcester, Massachusetts 01610
U.S.A.

Ian Burton
Department of Geography
University of Toronto
Toronto, Ontario, Canada

Requests for copies of these papers and correspondence relating directly thereto should be addressed to Boulder. In order to defray production costs, there is a charge of \$2 per publication on a subscription basis or \$3 per copy if ordered singly.

INTRODUCTION

Inclusiveness

"Natural hazards" refers to damaging meteorological and geophysical events in terms of their impact on man. This includes a wide range of topics. For example, the publications on "Flood" cited in this bibliography include items on dams and levees, zoning, flood-proofing, patterns of land use, warning systems, insurance, search and rescue, the economics of flood control, perception of the flood hazard, and more.

Excluded from the bibliography is the vast amount of technical literature in geology and meteorology on the physical aspects of natural hazards, and the technical engineering literature. Also excluded are evaluations of particular hazard events, unless generalized conclusions are drawn.

The selection of hazards to be included in this bibliography was somewhat arbitrary. Biological hazards and hazards which are partly natural, partly man-made, such as air pollution, are not included. Some natural hazards, such as clear air turbulence, have been excluded for lack of an adequate literature base.

Even given these limitations, there are hundreds of publications on natural hazards. It was necessary, therefore, to be highly selective. An attempt was made to avoid out-of-date and overlapping material. When the same author has published two or more items containing similar material, a "see also" after the first citation

will direct the reader to alternative sources.

The bibliography is arranged by last name of author within each natural hazard section. Each citation is numbered consecutively. The Subject Index and First Author Index at the end of this bibliography refer to the items in the bibliography by citation number.

A SELECTED, ANNOTATED BIBLIOGRAPHY ON

NATURAL HAZARDS

GENERAL

1. Adams, David, "The Red Cross: Organizational Sources of Operational Problems." American Behavioral Scientist 13, (January-February, 1970), 392-403.

Discusses the problems the Red Cross faces in its response to disaster which are caused by the addition of area-national staff and volunteers to the local organization.

2. Anderson, Jon W., "Cultural Adaptation to Threatened Disaster." Human Organization 27, (Winter, 1968), 298-307.

Presents the hypothesis, illustrated by seven studies of individual disasters, that reactions to a disaster are extensions of normal frames of reference, in both "disaster cultures" and in situations in which the normal frames of reference may be inappropriate.

3. Anderson, William A., "Military Organizations in Natural Disaster: Established and Emergent Norms." American Behavioral Scientist 13, (January-February, 1970), 415-422.

Discusses the problem that the military is generally expected to provide emergency assistance only at the request of civilian authorities. In an emergency, however, the military may be expected to act without authorization from civilian authorities.

4. Arsdol, Maurice D. Van, Georges Sabagh, and Francesca Alexander, "Reality and the Perception of Environmental Hazards." Journal of Health and Human Behavior 5, (1964), 144-153.

Compares the presence or absence of air pollution, traffic noise, brush fire, earth slide and flood in the respondent's neighborhood in Los Angeles with perception of the hazard; then controls for standard demographic variables, neighborhood satisfaction, and anomie.

5. Baker, George W. and Dwight D. Chapman, eds., Man and Society in Disaster. New York: Basic Books, 1962. 442 pp.

Contains 14 articles by various authors on a variety of disaster topics. See numbers 9, 13, 23, 32, 33, 59 in this bibliography.

6. Barker, Mary and Ian Burton, Differential Response to Stress in Natural and Social Environments: An Application of a Modified Rosenzweig Picture-Frustration Test. Natural Hazards Research Working Paper No. 5, University of Toronto: 1969, 18pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

The Rosenzweig Picture-Frustration Test was used to compare responses to social versus environmental frustration on a sample of introductory geography students. Cartoons in which the subject provided a reply for a cartoon character were paired for similar environmental and social situations portraying ego-blockage or superego-blockage. Responses were scored according to type, i.e., obstacle dominance, ego defense or needs persistence; and direction of response, i.e., intro-punitive, extrapunitive, or impunitive. The test is discussed as a method for research in the comparison of social and environmental responses.

7. Barton, Allen H., Communities in Disaster. New York: Doubleday, 1969. 344 pp.

An expansion of publication no. 8 of this bibliography, this is a review and synthesis of disaster research, excluding warning systems and pre-disaster behavior. It contains similar material and organization as the publication on which it is based, but unlike the first, this study also includes some psychological topics such as the victims willingness to communicate, sympathetic identification with the victim, and blaming the victim.

8. Barton, Allen H., Social Organization Under Stress: A Sociological Review of Disaster Studies. Disaster Study No. 17, Washington, D.C.: National Academy of Sciences, National Research Council, 1963, 208pp.

A review and synthesis of disaster research relating to sociological variables, but excluding pre-disaster adjustment and reactions to warnings. Topics covered include: The nature of disaster research; social roles in the emergency social system; organizational and mass behavior in the emergency social system; the restorative social system in community disaster; formal organization and the restorative system; conclusion: future needs in disaster research.

9. Barton, Allen H., "The Emergency Social System." In Man and Society in Disaster, edited by George W. Baker and Dwight W. Chapman. New York: Basic Books, 1962, 222-267.

A description and analysis of the emergency social system at the mass and organizational level based on disaster research. Covers: 1) factors influencing the adequacy of mass and organizational response, 2) factors influencing the quantity of the mass assault relative to need, 3) factors influencing organizational mobilization, 4) coordination within and between organizations, 5) the relationships between organizational and mass behavior, and 6) methods for increasing the output of the emergency system.

10. Brouillete, John R., "The Department of Public Works: Adaptation to Disaster Demands." American Behavioral Scientist 13, (January-February, 1970), 369-379.

A discussion of the organization, function, and resources of the typical public works department, its role in emergency, its ability to cope with varying degrees of emergency, and what characteristics make it an effective organization for emergency response.

11. Burton, Ian, Robert W. Kates, and Gilbert F. White, The Human Ecology of Extreme Geophysical Events. Natural Hazards Research Working Paper No. 1, University of Toronto: 1968, 33 pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

An overview of basic problems in natural hazards research relevant to the formulation and implementation of public policy. Topics discussed include hazard zone occupance, the range of human adjustment to natural hazards, hazard perception, the adoption of adjustments, optimal adjustment, the limits of adjustment, generalizability of response to hazards, and a note on the roles of uncertainty, crisis, and technology in the human response to natural hazards. 46 refs.

12. Burton, Ian and Robert W. Kates, "The Perception of Natural Hazards in Resource Management." Natural Resources Journal 3, (January, 1964), 412-441.

Discusses differences in perceptions of hazards within and between two groups: professionals who must deal with natural hazards on a scientific or technical basis, and resource managers. The variation in perception of hazards among professional is discussed in terms of inadequate scientific knowledge and the indeterminate character of natural hazards. Differences between professional and manager perception is attributed to the acknowledgment of uncertainty by the professional, whereas four strategies for denying uncertainty are used by managers. Perceptions of managers are discussed in terms of: 1) scientific uncertainty, 2) relation of hazard to dominant resource use, 3) frequency of hazard, 4) attitudes toward nature, 5) reaction to uncertainty, 6) nature of the personal hazard, and 7) lack of concrete standard which can be applied to hazard-related decisions.

13. Chapman, Dwight D., "A Brief Introduction to Contemporary Disaster Research." In: Man and Society in Disaster, edited by George W. Baker and Dwight D. Chapman. New York: Basic Books, 1962, 3-22.

A review of the literature.

14. Clifford, R. A., The Rio Grande Flood: A Comparative Study of Border Communities in Disaster. Disaster Study No. 7, Washington, D. C.: National Academy of Sciences, National Research Council, 1956, 145 pp.

A comparative field study of the response of two adjacent communities, one Mexican and the other American, to a severe flood. The communities differed in the efficiency of formal and informal organizations and the political structure in warning, evacuation and relief efforts; response of the townsfolk to evacuation; citizens' and officials' evaluation of relief efforts; patterns of helping behavior; and response to "outside" organizations. These differences are evaluated in terms of the political organization, social structure and cultural values of each community.

15. Dacy, Douglas C. and Howard Kunreuther, The Economics of Natural Disasters: Implications for Federal Policy. New York: The Free Press, 1969, 270 pp.

The main objective of this book is to "formulate a clear-cut case for the development of a comprehensive system of disaster insurance as an alternative to the current paternalistic Federal policy." Conclusions and recommendations are supported with statistics and case studies. Chapters: 1, The Cost of Natural Disaster in the United States; 2, Relief in Natural Disasters; 3, Economic Theory and Natural Disaster Behavior; 4, Problems of Information and Communication; 5, Short-Run Supply and Demand Problems; 6, Planning for Recovery: The Special Problem of Damage Assessment; 7, Population Migration: The Supply of Labor; 8, Reconstruction and Economic Developments Following a Disaster; 9, The Small Business Administration Disaster Relief Program; 10, Equity in Disaster Relief; 11, The Cost of Federal Relief; 12, The Need for Comprehensive Disaster Insurance.

16. Disaster Research Group, Field Studies of Disaster Behavior: An Inventory. Disaster Study No. 14. Washington, D. C.: National Academy of Sciences, National Research Council, 1961, 71 pp.

A catalogue of 114 field studies of 103 disaster situations which includes event, data, location, damage, number of interviews, research agency and principal research personnel, and reports and references.

17. Drabek, Thomas E., "Methodology of Studying Disasters." American Behavioral Scientist 13, (January-February, 1970), 331-343.

A review of the state of methodology in disaster research including recent innovations, and some suggestions for further improvement centering around selection and definition of organizational variable and event, greater use of simulations, and more comparative research of various kinds.

18. Drabek, Thomas E., "Social Processes in Disaster: Family Evacuation." Social Problems 16, (Winter 1969), 336-349.

Describes four types of evacuation patterns found in an interview study of responses to an evacuation warning prior to a major flood. The types of evacuation patterns were interrelated with source of warning and types of confirmation behavior.

19. Dynes, Russell R., "Organizational Involvement and Changes in Community Structure in Disaster." American Behavioral Scientist 13, (January-February, 1970), 430-439.

An analysis of the mobilization process in a disaster, centered around the idea that it is necessary for traditional organizational patterns to break down before mobilization can occur.

20. Dynes, Russell R., Organized Behavior in Disaster. Lexington, Massachusetts: D. C. Heath, 1970.

A review and synthesis of previously published literature and supplemental material under the headings: Disaster-activated Organizations, The Disaster Event and Community Stress, Disasters and Community Organization, Disaster Activities and Organizational Functioning, Ways of Conceptualizing Organized Behavior, Problems of Organized Activity in Disaster, Inter-organizational Relationships, and Changes in Community Structure in Disaster.

21. _____, Administrative, Methodological, and Theoretical Problems of Disaster Research. Disaster Research Paper 1965-4. Ohio State University, 1965, 19pp. See also Dynes, Russell, J. Eugene Haas, and E. L. Quarantelli, same title, Indian Sociological Bulletin 4, (July 4, 1967), 215-227.

A description of research focus and methodology of the Disaster Research Center, Ohio State University. The major interest is in organizations under stress. The laboratory work is briefly described, some methodological problems of the field work are discussed, and the theoretical framework used in studying organizations under stress is outlined.

22. Form, William H. and Charles P. Loomis, "The Persistence and Emergence of Social and Cultural Systems in Disasters." American Sociological Review 21, (1956), 180-185.

Presents evidence from previous literature on a tornado, a flood, and the effects of bombing on German cities to support hypotheses concerning organizational and cultural continuities in disasters.

23. Friedsam, H. J., "Older Persons in Disaster." In: Man and Society in Disaster, edited by George W. Baker and Dwight W. Chapman. New York: Basic Books, 1962, 151-182.

Discusses eleven hypotheses concerning the aged in disaster situations, with supporting research evidence. The hypotheses concern warning, evacuation, material loss, casualties, family ties, emotional response, and rehabilitation. The interview files of the Disaster Research Group were the primary source of data.

24. Fritz, Charles E. and J. H. Mathewson, Convergence Behavior in Disasters: A Problem in Social Control. Disaster Study No. 9, Washington, D.C.: National Academy of Sciences, National Research Council, 1957, 102 pp.

A study of unofficial convergence behavior in disaster, including personal, material, and informational convergence, using information from many different disaster studies. After a discussion of the nature of convergence and the scope of the problem, types of convergers, and methods and techniques for controlling convergence are discussed.

25. Fritz, Charles E. and Eli S. Marks, "The NORC Studies of Human Behavior in Disaster." Journal of Social Issues 10, (No. 3, 1954), 26-41.

On the basis of interviews of nearly 1,000 persons in over 70 major disasters, data is presented on percent of respondents reporting various affective reactions during and after impact; percent reporting more lasting effects of various kinds; the relationship of forewarning to prior social interaction, protective action, and levels of loss; percent of affective states according to time period, separation from family, and searching activities; and estimated percentage of traumatic reactions to dead or injured.

26. Fritz, Charles E., "Disasters Compared in Six American Communities." Human Organization 16, (Summer, 1957), 6-9.

Reports findings from a National Opinion Research Center disaster study centered around extensive interviews with those involved in six major disasters. Covers the social-psychological effects of disaster, common perceptions in disaster, initial behavior in disaster, leadership in disaster, and scapegoating in disasters.

27. Golant, Stephen and Ian Burton, "A Semantic Differential Experiment in the Interpretation and Grouping of Environmental Hazards." Geographical Analysis 2, (1970), 120-134.

The Semantic Differential was administered to subjects for a list of 12 hazards to be evaluated along 21 adjectival scales, some of which were new scales specifically designed for hazards research. Factor analysis revealed four scale factors: stability, controllability, magnitude, and expectancy; and three hazard concepts: man-made, natural, and quasi-natural.

28. Golant, Stephen, Human Behavior Before the Disaster: A Selected Annotated Bibliography. Natural Hazards Research Working Paper No. 9, University of Toronto: 1969. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

Forty-five citations, extensively annotated to include both summary and evaluation. Includes general material on stress and communication; psychological as well as behavioral material; and post- as well as pre-disaster material.

29. Golant, Stephen and Ian Burton, Avoidance-Response to the Risk Environment. Natural Hazards Research Working Paper No. 6, University of Toronto; 1969. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

206 subjects were asked to rank a list of social, physical, and environmental hazards according to desire for avoidance and to underline those they had experienced. The results were analyzed for the effect of experience upon desire for avoidance of the three types of hazards. The data was also analyzed for differences among respondents of various socio-economic categories and two personality characteristics.

30. Hewitt, Kenneth and Ian Burton, The Hazardousness of a Place: A Regional Ecology of Damaging Events. University of Toronto Department of Geography Research Publication No. 6, Toronto: University of Toronto Press, 1971, 147 pp.

A categorization and statistical survey of past and potential hazards at London, Ontario. Topics such as frequency and intensity of various hazards and the range of damage and adjustments are included.

31. Hewitt, Kenneth, "Probabilistic Approaches to Discrete Natural Events: A Review and A Discussion." Economic Geography 47, (1970), 332-349.

Provides a survey of probability models for discrete natural events (those events comprising only a fraction of a time or space continuum), and a discussion of logical design in the study of discrete events. Extensive bibliography.

32. Hill, Reuben and Donald A. Hansen, "Families in Disaster." In: Man and Society in Disaster, edited by George W. Baker and Dwight D. Chapman. New York: Basic Books, 1962, 185-221.

Authors combine research findings on individuals and organizations in disaster and findings on families under stress to form five propositions about family interaction with the community in a disaster and six propositions concerning interaction within the family under disaster situations. An evaluation of the applicability of three conceptual frameworks for family-disaster research is presented.

33. Janis, Irving L., "Psychological Effects of Warnings." In: Man and Society in Disaster, edited by George W. Baker and Dwight W. Chapman. New York: Basic Books, 1962, 55-92.

Hypotheses are presented concerning the following questions: 1) What warnings of potential danger result in effective preparation rather than denial or emotional overreaction and 2) under what conditions do prior warning, communications, or emotional adaptation produce sensitization to the disaster threat, and under what conditions do they produce underreactions? The hypotheses are supported with findings from disaster research. Conflicting, incomplete, or ambiguous evidence is noted.

34. Kates, Robert W., "Natural Hazard in Human Ecological Perspective: Hypotheses and Models." Economic Geography 47, (July, 1971), 438-451. Also published as Natural Hazards Research Working Paper No. 14, Clark University, Worcester, Massachusetts, 1970.

Presents a series of linked hypotheses for natural hazard research concerning man-nature interaction, techno-social stages, nature of the hazard, decision-maker classes, and aspects of individual decision-making. Develops a model of human adjustment to natural hazards and a submodel of adjustment process control, then shows how the model can be applied to East African agricultural drought.

35. Kennedy, Will C., "Police Departments: Organization and Tasks in Disaster." American Behavioral Scientist 13, (January-February, 1970), 354-361.

A general discussion of the major functions of the police in a disaster and the problems associated with performing these tasks.

36. Killian, Lewis M., "The Significance of Multiple-Group Membership in Disaster." American Journal of Sociology 62, (January, 1952), 309-314.

Using the results of studies of three tornado disasters and one explosion disaster, the significance of role conflicts in disasters is explored. Conflicts were found between family and secondary groups, heroic and occupational roles, the company and fellow workers, and the community and extra-community groups. In some cases, the decision as to role choice were important to the community as a whole during the crisis.

37. _____, An Introduction to Methodological Problems of Field Studies in Disasters. Disaster Study No. 8, Washington, D. C.: National Academy of Sciences, National Research Council, 1956, 35 pp.

38. Kilpatrick, F. P., "Problems of Perception in Extreme Situations." Human Organization 16, (Summer, 1957), 20-22.

Presents and discusses six hypotheses on perception in disaster suggested by laboratory research on perception.

39. Lee, Douglas H. D., "The Role of Attitude in Response to Environmental Stress." Journal of Social Issues 22, (October, 1966), 83-91.

A general discussion of the role of attitude in adaptation to environmental stress, the fact that attitude is most influential when stress is moderate, and various factors which may affect attitudes toward the environment.

40. Mack, Raymond W. and George W. Baker, The Occasion Instant: The Structure of Social Responses to Unanticipated Air Raid Warnings. Disaster Study No. 15, Washington, D. C.: National Academy of Sciences, National Research Council, 1961, 69 pp.

Chapter 6, "Some General Propositions and Hypotheses" is relevant to natural hazard research. About 50 propositions and hypotheses are stated concerning what factors influence an individual's interpretation of and behavior in response to a disaster warning. The propositions are based upon natural hazards literature and general psychological and sociological research as well as the research presented earlier in the report on reactions to air-raid warnings.

41. Natural Hazards Research Program, Suggestions for Comparative Field Observations on Natural Hazards. Natural Hazards Research Working Paper No. 16, 1970, 30 pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

States principal hypotheses for field work on natural hazards consisting of a description of the study site and a basic interview with a sample of 120 households, including administration of a sentence completion test. Lists the 16 components of the site study and discusses sample and procedure for the interviews and sentence completion test. Includes the Sentence Completion Test and General Questionnaire.

42. _____, Collaborative Research on Natural Hazards Progress Report. August, 1969, 24 pp. And Collaborative Research on Natural Hazards Progress Report. August, 1971, 12 pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

Description of research paradigm, summaries of work accomplished, and directions of future research. The program was initiated in 1967 under principal investigators Ian Burton (University of Toronto), Robert W. Kates (Clark University), and Gilbert F. White (University of Colorado).

43. O'Riordan, Timothy, The New Zealand Earthquake and War Damage Commission -- A Study of a National Natural Hazard Insurance Scheme. Natural Hazards Research Working Paper No. 20, University of Toronto, 1971, 30 pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

A case study of a national insurance scheme originally created for war damage, then extended to earthquakes and later to all "extraordinary" natural disasters. Evaluates the strengths and weaknesses of the legislation, especially the problems of limiting the fund's use to structurally sound buildings, and of limiting damage payments to extraordinary as opposed to normal events. Includes policy recommendations.

44. Parr, Arnold R., "Organizational Response to Community Crisis and Group Emergence." American Behavioral Scientist 13, (January-February, 1970), 423-429.

Presents conclusions based upon eleven disaster studies as to what conditions facilitate the creation of emergent groups.

45. Quarantelli, E. L., "The Community General Hospital: Its Immediate Problems in Disasters." American Behavioral Scientist 13, (January-February, 1970), 380-391.

Discusses the organization of hospitals and important problems facing hospitals during disaster under the headings: Disaster Plans, Mobilization, Information Processing, Task Assignment, Decision-Making, and Interorganizational Relationships.

46. _____, "A Selected Annotated Bibliography of Social Science Studies on Disasters." American Behavioral Scientist 13, (January -February, 1970), 452-456.

Contains brief annotations of major series, journal issues, and 19 books.

47. _____, "The Nature and Conditions of Panic." American Journal of Sociology 60, (November, 1954), 267-276.

Describes the psychological basis and overt features of panic behavior and the conditions in which panic is likely to occur, based on interviews gathered by the Disaster Team of the National Opinion Research Center. The majority of the interviews were from a series of house explosions, a plane crash, and an earthquake.

48. Raker, J. W., Anthony F. C. Wallace, and Jeannette F. Rayner, Emergency Medical Care in Disasters: A Summary of Recorded Experience. Disaster Study No. 6, Washington, D.C.: National Academy of Sciences, National Research Council, 1956, 75pp.

A general synthesis of knowledge about emergency medical care in disasters, based upon previously published material. Covers notification, extrication, first aid and field triage; transportation and traffic control; medical care of casualties; problems of medical care administration; public relations; and analysis and recommendations.

49. Rayner, Jeanette, "Annotated Bibliography on Disaster Research." Human Organization 16, (Summer, 1957), 30-40.

About 85 citations with summaries.

50. Roth, Robert, "Cross-Cultural Perspectives on Disaster Response." American Behavioral Scientist 13, (January-February, 1970), 440-451.

The importance of cross-cultural disaster research is discussed and a list of important dimensions in cross-cultural disaster research presented: degree of centralization, degree of differentiation, level of technology, the historical tradition, and dominant value orientation. Hypotheses were generated on the relative importance of the family, polity, and religion in three different cultural contexts as defined by the above dimensions.

51. Ross, James L., "The Salvation Army: Emergency Operations." American Behavioral Scientist 13, (January-February, 1970), 404-414.

Describes characteristics of the Salvation Army which enable it to be adaptable, flexible, and mobile, and to have a good public image. Also discusses its problems in emergency operations which involve internal conflict and conflict with the Red Cross.

52. Russell, Clifford S., "Losses from Natural Hazards." Land Economics 46, (November, 1970), 383-393.

Discusses the estimation of optimal adjustment to natural hazards with a model that takes into account the relative adequacy of and cost of human adjustments. Also discusses the influence on human adjustments of the tendency to deny the randomness of natural hazards and the implications of the assumption that man is master of nature.

53. _____, Losses from Natural Hazards. Natural Hazards Research Working Paper No. 10, University of Toronto: 1969, 25 pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

A general discussion of the role of various kinds of human adjustments and their interaction in the attempt to decrease losses from natural hazards.

54. Russell, J.A., et al., "Industrial Operations Under Extremes of Weather.: American Meteorological Society, Meteorological Monographs 2, (May, 1957), 121 pp.

Discusses the effects of weather on railroad operations, maintenance, and construction; the construction of industrial establishments; electric power utility operations; industrial water; primary iron and steel plant operations; petroleum refining and selected chemical industries; and the transportation equipment industries. The hazards of low temperature, snow sleet and ice, high wind, heavy rainfall, high humidity, and poor visibility are considered. Information is primarily qualitative rather than quantitative.

55. Schiff, Myra R., Some Theoretical Aspects of Attitudes and Perception. Natural Hazards Research Working Paper No. 15, University of Toronto: 1970, 20 pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

Presents definitions and relevant aspects of the theoretical work on attitudes and perceptions in precise but non-technical language with reference to the psychological literature.

56. Sewall, W. R. D., ed., Human Dimensions of Weather Modification. Chicago: University of Chicago Department of Geography Research Paper No. 105, 1966, 423 pp.

Contains 27 articles under the headings: The Problem in Perspective, Physical Capacity to Modify the Weather, Economic Evaluation of Weather Modification, Impacts on Various Economic Activities, Impacts on Urban Regions, Institutional Aspects, Perception of Effects of Weather and Attitudes to Weather, the Research Effort, and Broader Implications. Includes selected bibliography.

57. Shaskolsky, Leon, Volunteerism in Disaster Situations. Disaster Research Center, Ohio State University: 1967, 37 pp.

A theoretical essay on volunteerism and the change from Gesellschaft to Gemeinschaft sentiments which occurs during a disaster, with special reference to the relationship between formal organizations and volunteers. Contains an analysis of the contributions of non-organized volunteers to the Red Cross during a hurricane and subsequent flood.

58. Sheehan, Leslie and Kenneth Hewitt, A Pilot Survey of Global Natural Disasters of the Past Twenty Years. Natural Hazards Research Working Paper No. 11, University of Toronto: 1969, 18 pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

Includes world maps of a number of disastrous impacts, total loss of life from disasters excluding drought, and average number of deaths per disaster by 10° squares for 1947-1967. Tables: List of Unit Disasters Covering More than One 10° Square, Loss of Life and Number of Disaster Impacts by Nation-State, Loss of Life by Disaster Type and by Continents, Average Loss of Life Per Disaster Impact by Continents, and Percentage of Total Loss of Life for Each Disaster Type.

59. Sjørberg, Gideon, "Disasters and Social Change." In: Man and Society in Disaster, edited by George W. Baker and Dwight W. Chapman. New York: Basic Books, 1962, 356-384.

A general discussion of social change caused by disasters -- war and epidemics as well as natural disasters -- with regard to local versus widespread disasters, industrial versus pre-industrial societies, short-run versus long-run effects, and disasters in which there is hope of adjustment versus disasters in which hope is lacking.

60. United Nations Educational, Scientific and Cultural Organization, Annual Summary of Information on Natural Disasters. No. 1, 1966; No. 2, 1967. Belgium: UNESCO, 1970, 66 and 81 pp.

Contains geological and meteorological information on earthquakes, tsunamis, storm surges, and volcanic eruptions, worldwide.

61. United States Department of Commerce, Environmental Science Services Administration, A Proposed Nationwide Natural Disaster Warning System (NADWARN). Report with Background information prepared by the Natural Disaster Warning Survey Group. Washington, D. C. : October, 1965, 113 pp.

A description of a plan to expand and improve the United States natural hazards warning network, along with background information on frequency and damage from various natural hazards in the United States, the present warning system, present communications facilities, detection and processing problems, problems of public understanding and reactions during emergencies, legislative and executive orders setting forth responsibility for warning and action in natural disasters, a list of natural disaster preparedness manuals, and a glossary.

62. United States Department of Commerce, National Oceanic and Atmospheric Administration, Operations of the National Weather Service. Silver Spring, Maryland: October, 1971, 231 pp.

Describes the organization and services of the National Weather Service, and its communication network. Particularly relevant to the subject of natural hazards are the descriptions of the warning services for various natural hazards. Includes maps of the service networks for each program.

63. United States Office of Emergency Preparedness, Report to the Congress Vol. 1: Disaster Preparedness. Washington, D.C.: 1972, 195 pp.

Contains chapters on disaster preparedness with regard to vulnerability, prediction and warning capability, preventive measures, and government response for general hazard, river floods, tornadoes and windstorms, hurricanes and storm surges, forest and grass fires, earthquakes, landslides, tsunamis, volcanoes, frosts and freezes, and droughts. Discusses land use and construction, disaster insurance, weather modification, and the application of science and technology. Presents historical data on legislation and statistical data.

64. _____, Report to the Congress Vol. 2: Disaster Preparedness. Washington, D.C.: USGPO, 1972, 25 pp.
An Example State Disaster Act of 1972 and commentary.
65. _____, Report to the Congress Vol. 3: Disaster Preparedness. Washington, D. C.: USGPO, 1972, 143 pp.
Consists of ten chapters covering causes and effects, threat and vulnerability, and technological countermeasures of the hazards river floods, tornadoes and grass fires, earthquakes, landslides, tsunamis, volcanoes, frosts and freezes, and droughts.
66. United States Senate, Committee on Government Operations Federal Disaster Relief Manual, (Revised Edition). 88th Congress, 1st Session. Washington, D. C.: August, 1963, 150 pp.
Outlines for each of eighteen federal agencies the following information: available disaster assistance, the agency's disaster responsibilities, who is eligible for assistance, where to apply, and other pertinent information. Appendices include copies of the Federal Disaster Act and other relevant executive orders, laws, and regulations.
67. Vaughan, Christopher, Notes on Insurance Against Loss from Natural Hazards. Natural Hazards Research Working Paper No. 21, University of Toronto: 1971, 56 pp.
Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.
See also, Vaughan, Christopher, Insurance Against Loss from Natural Hazards. M.A. Thesis, University of Colorado, Boulder: Department of Geography, 1971.
Includes a description of hazard insurance in various countries; an analysis of various types of property and crop insurance in the United States; and an exploration of factors that might influence the sale of natural hazards insurance. After charting the relationship between life insurance and several economic indicators, the relationships of crop-hail insurance to national income, crop-hail insurance to agricultural production and crop-hail insurance to life insurance are explored.
68. Warheit, George, "Fire Departments: Operations During Major Community Emergencies." American Behavioral Scientist 13, (January-February, 1970), 362-368.
A general discussion of the functions and organization of fire departments, and the organizational problems that arise during disasters.

69. Williams, Harry B., "Human Factors in Warning and Response Systems." In: The Threat of Impending Disaster: Contributions to the Psychology of Stress, edited by George H. Grosser, Henry Wachsler, and Milton Greenblatt. Cambridge, Massachusetts: The MIT Press, 1964, 79-104.

Presents a model of the warning and response system and discusses the parts of the system, using previous research findings on warning and response in natural hazards.

70. "Some Functions of Communication in Crisis Behavior." Human Organization 16, (Summer, 1957), 15-19.

Presents and discusses eight generalizations concerning information and communication in disasters, but with only sketchy reference to specific research.

71. Yutzy, Daniel, "Priorities in Community Response." American Behavioral Scientist 13, (January-February, 1970), 344-353.

A general discussion of the idea that in a disaster, new goals receive greater priority, thus altering more traditional social functions and organizational response.

AGRICULTURAL FROST

72. De Villiers, G. B. D., "Protection of Crops Against Frost Damage by Active and Passive Methods." In: Agricultural Meteorology: Proceedings of the WMO Seminar, Volume 2. Melbourne: Bureau of Meteorology, 1968, 649-666.

Research is cited to show that there is little progress in the development of an effective, economical method of frost protection. Passive methods of frost control discussed are: location selection, growing season, plant breeding and selection, cultural practices, and plant management. Active methods include greenhouses, artificial fogs and mists, wind machines, sprinkling, and heating.

73. Hewes, Leslie, "Wheat Failure in Western Nebraska 1931-1954." Annals of the Association of American Geographers 48, (1958), 375-397.

Using crop insurance data and other sources, a statistical summary of principle causes and extent of wheat failure by county for drought, winterkill, hail, and wind was made. An assessment of the effectiveness of summer fallow in reducing damage is presented, and the effectiveness of other farming practices discussed. The author concludes that all the factors which have contributed to the reduction of wheat failure since 1937 are cultural except one -- autumn precipitation. Thus, although wheat yield is subject to a large amount of human control, it is not unreasonable to expect a repetition of the high failures of 1931-1937.

74. U.S. Department of Agriculture, Economic Research Service, Economic Considerations in Crop Insurance. Washington, D.C.: 1970, 87pp.

This report describes the present use of insurance in terms of coverage, premiums paid, and indemnities, and discusses the differences between crop-hail and all-risk insurance. Concepts of crop yield variability, the sources of variability, and the impact of production technology are discussed. Analyses are made of the relation of coverage to indemnities and premiums on individual farm contracts. The report discusses the problems of adverse insurance risks, and illustrates the use of normal distribution theory and statistical procedures in projecting probable indemnities. It analyzes the influence of the level of yield guarantee and the shape of the yield distribution on probable indemnities. The question of the financial reserves that may be needed by the insurer is examined.

75. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Frost and the Prevention of Frost Damage. Silver Spring, Maryland, 1970, 33pp.

Describes the effectiveness of various methods of reducing frost damage, lists damaging temperatures for various kinds of fruit, and discusses meteorological instruments and exposures, and economic factors in frost protection.

76. Wang, Jen Yu and Gerald L. Barger, Bibliography of Agricultural Meteorology. Madison: University of Wisconsin, 1962, 673pp.

A comprehensive bibliography arranged by general topic with a subject index and author index. Contains 193 citations on agrometeorological forecasting, 345 on conservation and irrigation, 232 on drought, and 318 on freezing damage.

AVALANCHE

77. Frutiger, Hans, "Behaviour of Avalanches in Areas Controlled by Supporting Structures." In: International Symposium on Scientific Aspects of Snow and Ice Avalanches, Reports and Discussions. Sponsored by the International Union of Geodesy and Geophysics and the International Association of Scientific Hydrology. L'Association Internationale d'Hydrologie Scientifique, Braamstraat 61, Gentbrugge, Belgium: 1966, 243-250.

Using summaries of several unpublished case studies of the failure of supporting structures, discusses the inadequacies of supporting structures in avalanche control.

78. Schaerer, P. A., "Planning Avalanche Defense for the Trans-Canada Highway at Rogers Pass, B.C." Engineering Journal 45, (March, 1962), 31-38. See also more detailed version, Schaerer, P. A., "Planning Avalanche Defense for the Trans-Canada Highway at Rogers Pass, B.C.," published by the Canadian National Research Council, Division of Building Research, Ottawa, November, 1962.

Describes the Avalanche survey taken to identify avalanche sites and assess the degree of hazard at each site; presents an avalanche classification; and discusses the possible adjustments to avalanches. The feasibility of using each kind of adjustments at Rogers Pass is discussed. The cost of various adjustments is compared, and an avalanche defense plan for the area is presented.

79. U.S. Department of Agriculture, Forest Service, Snow Avalanches: A Handbook of Forecasting and Control Measures. Agricultural Handbook No. 194, Washington, D.C.: revised, 1968, 84pp.

Contains chapters on Physics of the Snow Cover, Avalanche Characteristics, Terrain, Avalanche Hazard Forecasting, Standard Snow Observations and Terminology, Snow Stabilization, Safety, Avalanche Defenses, Avalanche Rescue, Area Safety Planning.

DROUGHT

80. Adademiia Nauk SSSR, Institut Geografii, Sukhovei ikh Proiskhozhdenie i bor'ba s nimi (Sukhoveis, their origin and control). Moscow, Akademiia Nauk SSSR, 1957, 370pp. Bibliography on Dry Winds and Droughts and Control Measures, pp. 354-367, appended.

Articles from three conferences covering: 1) causes, criteria and extension of drought and sukhoveis, 2) katabatic or advective winds and their role in sukhoveis, 3) role of wind itself, 4) of evaporation and its observation and study, and 5) of methods of effectively controlling drought. (This annotation from reference No. 121).

81. Albertson, F. W., G. W. Tomanek and A. Riegel, "Ecology of Drought Cycles and Grazing Intensity." Ecological Monographs 27, (1957), 27-44.

Discusses the effect of drought on grasslands and presents a study of the effects of drought on grasslands which have had varying degrees of grazing intensity. Reasons why overgrazed land is much more susceptible to drought than moderately or lightly grazed land are discussed.

82. Berry, L., T. Hankins, R. W. Kates, L. Maki, and P. Porter, Human Adjustments to Agricultural Drought in Tanzania: Pilot Investigations. Natural Hazards Research Working Paper No. 19, Bureau of Resource Assessment and Land Use Planning: University of Dar es Salaam, Research Paper No. 13, January, 1971, 49pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

Includes an assessment of magnitude, intensity, and frequency of drought and famine in Eastern and Central Tanzania; an assessment of the full range of adjustments to drought by extensive interviews, searches of technical literature, and consultation with agricultural experts; results of interviews with farmers on perception of and adjustments to drought; a theoretical model to be used in choosing an optimal set of adjustments; and a sample computer program for the analysis of moisture stress.

83. Booth, Alfred W. and Don Voeller, Meteorological Drought and its Social Impact in Illinois. Department of Geography, Water Resources Center, University of Illinois, Urbana: March, 1967, 31pp.

Investigates the relationship between various social and economic parameters, such as attitudes and opinions, drought adjustment, variation in income, sales, and employment, etc., and meteorological drought by means of newspapers, interviews, and records. Lists general effects of drought and poses new questions for research.

84. Borchert, John R., "The Dust Bowl in the 1970's." Annals of the Association of American Geographers 61, (March, 1971), 1-22.

Discusses the periodicity of drought in the Great Plains and the economic and social adjustments which have followed each drought. Predicts that the same responses will be accelerated by the next drought. Some of these are fewer, bigger, and more fragmented farms, public controls and subsidies, consolidation of urban businesses and services, and greater management. There is also the possibility of a new structure of land tenure emerging, and other basic changes.

85. Brooks, Reuben, "Human Response to Recurrent Drought in Northeastern Brazil." The Professional Geographer 23, (January, 1971), 40-44.

Discusses the social consequences of drought in Northeastern Brazil with particular reference to the 1877 drought in which an estimated 2,000,000 died. The social impact of drought is discussed as a sequence of consequences: economic, physiological, sociological, and political.

86. Chang, Jen-hu, Climate and Agriculture. Chicago: Aldine, 1968, 304pp.

A text of the effects of radiation, temperature, wind, and moisture on crop growth. Chapters relevant to drought and frost are frost protection; water in relation to plant growth; evapotranspiration; lysimeters; empirical formula; the aerodynamic approach; the energy budget approach; evaporimeters; water balance; water and yield relationship; dew, fog, and humidity; and wind.

87. Chow, Ven Te, Handbook of Applied Hydrology. New York: McGraw-Hill, 1964, approximately 1400pp.

A comprehensive handbook dealing with sciences related to hydrology, hydrologic phenomena, practice and application of hydrology, and socio-economic aspects of hydrology. Numerous references follow each of 29 sections. Under the category of socio-economic aspects are sections on water resource planning and development, water law, water policy, and applications of electronic computers in hydrology.

88. Clark, Colin, The Economics of Irrigation, second edition. Oxford: Pergamon, 1966, 155pp.

Chapters are: Definitions, Water Requirements of Plants, Economic Returns to Irrigation, The Costs of Irrigation, Water Resources, Charges for Water, and Desalination.

89. Davidson, B., "Economic Aspects of Drought Losses among Australian Sheep Flocks." In: Report of the A.N.Z.A.A.S. Symposium on Drought. Commonwealth of Australia, Bureau of Meteorology, Melbourne: 1967, 7-16.

Presents a method for calculating the optimum economic strategy for sheep farmers during drought -- feeding the sheep during the drought or selling them.

90. Davitaia, F. F., Nauchnye osnovy bor'by s zasukhoi po prirodnym zonom SSSR, (Scientific Bases of Drought Prevention by Natural Zones of the U.S.S.R.). Akademiia Nauk SSSR, izvestiia, Ser. Geog. 1, (January/February, 1959), 7-29.

The general meteorological conditions associated with drought in steppe and forest steppe regions and arid regions, the climatic factors in arid regions favoring high agricultural productivity, and the profitability of irrigation as a function of expense of irrigation are discussed and a comprehensive account is given of various scientific agricultural techniques for preventing drought. (Annotation from reference No. 121).

91. Donovan, P.A., "Drought and Crop Ecology." In: Papers from the Symposium on Drought and Development. Salisbury: The Association of Scientific Societies in Rhodesia, 1968, 104-111.

Describes a method for determining the beginning and end of the growing season in different types of soil, where the season is limited by amount of moisture. Because there are few droughts within the growing season of the area studied, crops of short maturation rather than the traditional drought-adapted crops should be used.

92. Eckstein, Otto, Water Resource Development: The Economics of Project Evaluation. Cambridge: Harvard University Press, 1961, 300pp.

Following an outline of the general theoretical basis of benefit-cost analysis, the procedures for measuring benefits and costs employed by the Bureau of Reclamation and the Army Corps of Engineers are analyzed for flood control, irrigation, navigation, and electric power. The present extent of cost sharing by the beneficiaries is explored together with the amount of local charges that economic analysis suggests. Principles and techniques by which joint costs can be allocated are discussed.

93. Gould, Peter R., "Man Against His Environment: A Game Theoretic Framework." Annals of the Association of American Geographers 53, (1963), 290-297.

Demonstrates how a game-theoretic approach may be used to determine the most efficient choice of crop proportions in a dry area in Ghana, and how it can be used to determine which proportion of cattle should be sold at each of five markets when the choice is influenced by variable precipitation.

94. Gray, James R. and C. V. Plath, Economics of Adjusting to Drought in Eastern Oregon Cattle Ranches. Oregon State College Agricultural Experiment Station Miscellaneous Paper No. 48. Corvallis: 1957, 44pp.

A study of the economic effects of using five major drought practices; buying hay during drought, buying concentrates during drought, reducing herd size, increasing leases of range and cropland, and making no change.

95. Heathcote, R. L., "Drought in Australia: A Problem of Perception." Geographical Review 59, (1969), 175-194. See also Heathcote, R. L., "The Effects of Past Droughts on the National Economy." In: Report of the A.N.Z.A.A.S. Symposium on Drought. Commonwealth of Australia, Bureau of Meteorology, Melbourne: November, 1967, 27-46.

After a discussion of general problems in the definition, measurement, and registration of drought, and positive and negative economic aspects of drought and drought relief are discussed. Finally, the perception of farmers, government, the general public, and some "experts" toward drought is discussed, along with the implications of drought perception to drought adjustments.

96. Heathcote, Ronald L., "The Pastoral Ethic: A Comparative Study of Pastoral Resource Appraisals in Australia and America." In: Arid Lands in Perspective, edited by William G. McGinnies and Bram J. Goldman. Tucson: University of Arizona Press and Washington, D.C.: The American Association for the Advancement of Science, 1969, 312-324.

Describes the official settlement policy of Australian and U.S. governments to its semi-arid rangeland and the attitudes and policies of the settlers which, in some cases, motivated the circumvention of government policy. A pastoral ethic comprised of the characteristics of independence, commercialism, and the pioneer syndrome is described as it relates to land-use policy.

97. Hewes, Leslie, "Wheat Failure in Western Nebraska 1931-1954." Annals of the Association of American Geographers 48, (1958), 375-397.

Using crop insurance data and other sources, a statistical summary of principle causes and extent of wheat failure by county for drought, winterkill, hail, and wind was made. An assessment of the effectiveness of summer fallow in reducing damage is presented, and the effectiveness of other farming practices discussed. The author concludes that all the factors which have contributed to the reduction of wheat failure since 1937 are cultural except one -- autumn precipitation. Thus, although wheat yield is subject to a large amount of human control, it is not unreasonable to expect a repetition of the high failures of 1931-1937.

98. Hirshleifer, Jack, James C. De Haven, and Jerome W. Milliman, Water Supply: Economics, Technology, and Policy. Chicago: University of Chicago Press, 1960, 386pp.

Contents: The Water Problem; Our Water Resources: The Present Picture; The Economics of Utilization of Existing Water Supplies; Criticisms of Market Allocations; The Political Allocation Process; Municipal Water Rates; Investment in Additional Water Supplies; The Practical Logic of Investment Efficiency Calculations; Technological Features and Costs of Alternative Supplies of Water; Water Law; Government Discretion or Property Rights?; New York's "Water Crisis"; Case Study of a Crucial Decision; Water for Southern California: Case Study of an Arid Region; Some Controversial Conclusions and Their Implications.

99. Huff, F. A. and S. A. Chagnon, "Evaluation of Potential Effects of Weather Modification on Agriculture in Illinois." Journal of Applied Meteorology 11, (March, 1972), 376-384.

An investigation of the potential effects of modifying growing-season rainfall on crop-yield in Illinois, using several hypothetical seeding models, under assumed seeding conditions lasting 1, 2, 3 and 5 years, for each of 13 regions with similar yield characteristics.

100. Hughs, William F. and A. C. Magee, Some Economic Effects of Adjusting to a Changing Water Supply, Texas High Plains. The Agricultural and Mechanical College of Texas, College Station: Texas Agricultural Experiment Station, 1960, 27pp.

Discusses the adjustments made to a decline in water level and reduction of water supply; and the economic effects of each kind of adjustment.

101. Lee, Robert R., Gerald A. Fleischer and Vincent J. Roggeveen, Engineering-Economic Planning of Water Resources: A Selected Bibliography. Stanford, California: Stanford University Project on Engineering-Economic Planning, September, 1961, 84pp.

Contains 827 citations under the headings: Bibliographies; Administration; Policy and Planning; Case Studies; Economic Considerations: Cost Allocation and Repayment; Economic Considerations: Evaluation; Economic Considerations: Financing; Economic Considerations: Rates; Economic Considerations: General, Flood Control; Law; Pollution; Regional Studies; Supply and Uses; General.

102. Lydolph, Paul E., "The Russian Sukhovey." Annals of the Association of American Geographers 54. (September, 1964), 291-309.

A general article on the causes, distribution, effects, and measures of combatting the effects of the Russian sukhovey.

103. Maass, Arthur, Maynard M. Hufschmidt, Robert Dorfman, Harold A. Thomas, Jr., Stephen A. Marglin, and Gordon Maskew Fair, Design of Water Resource Systems: New Techniques for Relating Economic Objectives, Engineering Analysis, and Governmental Planning. Cambridge: Harvard University Press, 1962, 620pp.

Chapters: Objectives of Water Resource Development: A General Statement; Basic Economic and Technologic Concepts: A General Statement; Economic Factors Affecting System Design; Application of Basic Concepts: Graphic Techniques; Methods and Techniques of Analysis of the Multi-Unit, Multi-purpose Water Resource System: A General Statement; A Simplified River Basin System for Testing Methods and Techniques of Analysis; Conventional Methods of Analysis; Analysis by Simulation: Programming Techniques for a High-Speed Digital Computer; Analysis by Simulation: Examination of Response Surface; Operating Procedures: Their Role in the Design of Water Resource Systems by Simulation Analyses; Mathematical Synthesis of Streamflow Sequences for the Analysis of River Basins by Simulation; Mathematical Models: The Multistrukture Approach; Mathematical Models: A Stochastic Sequential Approach; System Design and the Political Process: A General Statement.

104. McGuire, Kevin, "Economic Effects of Drought on 12 Properties in the W. A. Pastoral Zone." Quarterly Review of Agricultural Economics (Canberra, Australia) 15, (April, 1962), 87-95.

Tabulates the economic situation of sheep farmers from 1952-1960, which includes periods of drought.

105. Myrick, Dana, All-risk Crop Insurance: Principles, Problems, Potentials. Montana Agricultural Experiment Station, Bulletin No. 640, Bozeman: September, 1970, 42pp.

Attention is called to the relatively short history of the crop insurance program. Precipitation records indicate that an actuarial period of at least 20 years is required-for a sound rating program for drought. Therefore, barely one actuarial period has been completed since the program was placed on an experimental basis in 1947. The elements of a sound actuarial system, which the FCIC must develop, are discussed.

106. Parra, Carlos, Drought Perception and Adjustments in Yucatan, Mexico. M.A. Thesis, University of Colorado, Boulder: Department of Geography, 1971, 54pp. See also, Parra, Carlos G., "Perception of Past Droughts in Ticul, Yucatan, Mexico." In: Proceedings of the Annual Meeting of the Association of American Geographers, 1971, Great Plains-Rocky Mountain Division. U.S. Air Force Academy, Colorado.

A field study of perception of and adjustment to drought which investigates six hypotheses concerning variation in hazard perception, technological stages in hazard response, determinants of choice of adjustments, estimation of economic efficiency of adjustments, reasons for occupancy of the hazard area, and the influence of government on choice of adjustments.

107. Paylore, Patricia, "Bibliographical Sources for Arid Lands Research." In: Arid Lands in Perspective, edited by William G. McGinnies and Bram J. Goldman. Washington, D.C.: The American Association for the Advancement of Science and Tucson: University of Arizona Press, 1969, 249-275.

An annotated bibliography of bibliographies containing 367 entries and a subject index.

108. Raikes, Robert L. "Formation of Deserts of the Near East and North Africa: Climatic, Tectonic, Diotic, and Human Factors." In: Arid Lands in Perspective, edited by William G. McGinnies and Bram J. Goldman. Washington, D.C.: The American Association for the Advancement of Science and Tucson: University of Arizona Press, 1969, 147-154.

Presents the thesis that desert formation is the result of weather fluctuation rather than climatic change or tectonics, because non-desert plants cannot survive once a period of drought has eliminated them, due to soil erosion and lack of a repopulation source. Even if reestablished, however, the next dry period would eliminate them. Man hastens the formation of deserts by land abuse.

109. Russell, Clifford S., David G. Arey, and Robert W. Kates, Drought and Water Supply: Implications of the Massachusetts Experiences for Municipal Planning. Baltimore: Johns Hopkins, 1970, 232pp.

An intensive field study of the water supply system during a record four-year drought in the state of Massachusetts utilizing questionnaires, public documents, intensive interview surveys of 48 communities, newspaper files, and several special studies. The book is divided into 5 parts: Water Supply and Demand: the Level of System Adequacy; Climatic Variation, the Level of Shortage, and the Nature of Short-run Adjustments; the Economic Impact of Water Shortage; A Planning Model for Municipal Water Supply Systems; and Practical System Planning.

110. Saarinen, Thomas F., Perception of Drought Hazard on the Great Plains. The University of Chicago Department of Geography Research Paper No. 106, Chicago: 1966, 183pp.
Perception of the drought hazard of great plains wheat farmers was studied by means of a modified thematic apperception test and a questionnaire which covered perception of the hazard, perception of adjustments, whether or not the respondent had tried various adjustments, and why or why not. Differences in adjustments between farmers in densely versus sparsely settled areas was investigated, along with the relationship between perception of the hazard and: 1) aridity of the area, 2) amount and frequency of drought experienced and 3) personality differences. Appendices: I. A Glossary of Drought Definitions, II. Questionnaire, Perception of Drought Hazard, and III. Records of Past Droughts for Individual Study Areas.
111. Schickele, Rainer, "Farmers Adaptations to Income Uncertainty." Journal of Farm Economics 32, (1950), 356-374.
Lists the various strategies available for pulling through a series of low-yield years; discusses the effect of farm size; and explains how next year's yield can be estimated, based on the fact that there is a wide variation in yield and that good years and bad years tend to go in runs.
112. Subrahmanyam, V. P., Incidence and Spread of Continental Drought. Geneva: World Meteorological Organization, 1967, 52pp.
A review of the literature on definitions and concepts, indices and criteria, and drought assessment. A section on problems for study is included. Bibliography. Russian and French summaries.
113. Sugg, Arnold E., "Beneficial Aspects of the Tropical Cyclone." Journal of Applied Meteorology 7, (1968), 39-45.
Discusses the drought-breaking effects of some tropical cyclones and tabulates which cyclones have been most beneficial in this respect.
114. Tannehill, Ivan Ray, Drought: Its Causes and Effects. Princeton: Princeton University Press, 1947.
After more general discussions of the effects of drought and the general causes of rainfall and lack of rainfall the author focuses upon and defends the cycle theory of drought, in the context of the general theory that climate is controlled by variations in solar radiation.

115. Terfertiller, K. R. and R. J. Hildreth, "Importance of Weather Variability on Management Decisions." Journal of Farm Economics 43, (1961), 1163-1169.

Briefly reviews some of the Great Plains research on the tendency of good and bad years to bunch, and offers a general strategy which can be used by farmers to plan for maximum capital accumulation in the face of weather uncertainty.

116. Their, Philip J., Meeting the Impact of Crop-Yield Risks in Great Plains Farming. Agricultural Experiment Station, North Dakota Agricultural College, Fargo, North Dakota: 1954, 34pp.

The agricultural adjustments of farmers in two counties with the same long-term average yield; but with a much greater variability of crop yields in one county than the other, were studied. Special emphasis is placed upon the characteristics of farming practices and situations associated with federal all-purpose crop insurance. An evaluation of the program based on interviews with farmers and the data on insurance use is presented. Included the relationship between insurance use and vulnerability, and between all purpose insurance use and other adjustments such as hail insurance.

117. United Nations Educational, Scientific and Cultural Organization, Plant-Water Relationships in Arid and Semi-Arid Conditions: Reviews of Research. Paris: UNESCO, 1960, 225pp.

Contains the following reviews: The income and loss of water in arid and semi-arid zones by F. L. Milthorpe, Soil water relations in arid and semi-arid conditions by W. R. Gardner, physiological and morphological changes in plants due to water deficiency by O. Stocker, Adaptation to drought: xerophytism by H. R. Oppenheimer, Methods of research on water relations by F. E. Eckardt, The management of native vegetation in arid and semi-arid regions by R. M. Moore, Principles of dry land crop management in arid and semi-arid zones by Sterling A. Taylor, Significance of fallow as a management technique in continental and winter-rainfall climates by W. J. Staple, Principles of irrigated cropping by Robert M. Hagan and Yoash Vaadia.

118. U.S. Department of Agriculture, Economic Considerations in Crop Insurance. Economic Research Service, Washington, D.C.: 1970, 87pp.

This report describes the present use of insurance in terms of coverage, premiums paid, and indemnities, and discusses the differences between crop-hail and all-risk insurance. Concepts of crop yield variability, the sources of variability, and the impact of production technology are discussed. Analyses are made of the relation of coverage to indemnities and premiums on individual farm contracts. The report discusses the problems of adverse insurance risks, and illustrates the use of normal distribution theory and statistical procedures in projecting probable indemnities. It analyzes the influence of the level of yield guarantee and the shape of the yield distribution on probable indemnities. The question of the financial reserves that may be needed by the insurer is examined.

119. _____, Facts About Wind Erosion and Dust Storms on the Great Plains. Washington, D.C.: USGPO, revised 1961, 8pp.

Brief review of history, causes, and remedies for wind erosion and dust storms.

120. _____, For Insurance Against Drought: Soil and Water Conservation. Farmer's Bulletin No. 2002, 1950, 21pp.

Outlines several farming practices which may help improve yields during drought and prevent wind erosion.

121. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, Drought Bibliography, by Wayne C. Palmer and Lyle M. Denny. NOAA Technical Memorandum EDS 20, Silver Spring, Maryland: NOAA, June, 1971, 236pp.

A bibliography of 3,150 entries divided into 44 subtopics under the headings: General, Descriptive, Causes, Effects, and Countermeasures. Arranged by topic and within topics, by year through 1968. Author index and information on availability included. Abstracts included when available.

122. U.S. Geological Survey, General Effects of Drought on Water Resources of the Southwest, by J. S. Gatewood, Alfonso Wilson, H. E. Thomas, and L. R. Kister. Geological Survey Professional Paper 372-B, Washington, D.C.: USGPO, 1964.

Contains sections on Soil Water, Ground Water, Natural Streamflow, Quality of Water, Economic and Related Effects, and Allocation of Water.

123. United States Committee on Appropriations, Hearings Before the Committee on Appropriations, 83rd Congress, 2nd Session on H. R. 8481, an act making supplemental appropriations for the fiscal year ending June 30, 1954, and for other purposes. Washington, D.C.: 1954, 88-115.

Contains a general discussion of the great plains drought, data on crop losses, and the extent of and damage resulting from wind erosion.

124. United States Works Progress Administration, Division of Social Research, Farming Hazards in the Drought Area, by R. S. Kifer and H. L. Stewart. Research Monograph No. 16, Washington, D.C.: 1938, 219pp.

For the Northern, Central, and Southern Great Plains, a summary is presented of the drought situation including types of farming, crop yields, organization of farms, farm income, indebtedness, and tenureship. Prospects for rehabilitation are discussed by area. 72 tables.

125. Verbeek, W. A., "Drought and Livestock Management." In: Papers from the Symposium on Drought and Development. Salisbury: The Association of Scientific Societies in Rhodesia, 1968, 112-117.

Presents a few basic principals of livestock management during drought.

126. Wang, Jen Yu and Gerald L. Barger, Bibliography of Agricultural Meteorology. Madison: University of Wisconsin, 1962, 673pp.

A comprehensive bibliography arranged by general topic with a subject index and author index. Contains 193 citations on agrometeorological forecasting, 345 on conservation and irrigation, 232 on drought, and 318 on freezing damage.

127. World Meteorological Organization, Windbreaks and Shelterbelts. Technical Note No. 59, Geneva: 1964, 188pp.

A detailed report on the effects of shelterbelts and windbreaks on microclimate, soil climate, soil erosion and plants and animals. Extensive bibliography. Figures, diagrams. French, Russian, and Spanish summaries.

EARTHQUAKE

128. Ad Hoc Panel on Earthquake Prediction, Earthquake Prediction: A Proposal for a Ten Year Program of Research. Prepared for the Office of Science and Technology, Washington, D.C.: 1965, 39pp.

A detailed proposal including geological and geophysical field studies, research into the physical basis of earthquakes, earthquake engineering research, and miscellaneous projects. Research budget is included. Appendices: Field Observations in Seismic Areas, Physical Basis of Earthquakes, the Prediction Problem in Geophysics, Earthquake Engineering, Current Government Efforts Pertinent to Earthquake Prediction, and Some of the World's Worst Earthquakes.

129. Anderson, William A., Disaster and Organizational Change: A Study of the Long-term Consequences in Anchorage of the 1964 Alaska Earthquake. Disaster Research Center Monograph Series No. 6, Ohio State University: 1969, 87pp. See also, Anderson, "Disaster and Organizational Change in Anchorage." In: The Great Alaska Earthquake of 1964: Human Ecology. National Academy of Sciences, National Research Council, Committee on the Alaska Earthquake, Washington, D.C.: 1970, 96-115.

Discusses the long-term effects of the Alaska Earthquake on 23 Anchorage organizations. For each organization, the pre-disaster structure is recorded; the nature of the change, if any; whether the change was caused by internal problems or an altered environment; and whether the change was a new pattern or an acceleration of previously existing trends.

130. Arya, A. S., "Earthquake Resistant Construction in Low Cost Buildings." In: Proceedings of the International Symposium on Low Cost Housing Problems Related to Urban Renewal and Development, October 8-9, 1970, edited by Oktay Ural, Department of Civil Engineering, University of Missouri, Rolla, Missouri 65401, 7pp.

A review of the behavior of various kinds of construction in earthquakes, including damage charts for reinforced and unreinforced brick masonry, wooden frame with and without fill, and adobe construction. Discusses the effects of providing small amounts of reinforcement to "feebly suitable" buildings, the effect of foundation soil on structural behavior, and details of construction which effect earthquake resistance.

131. Buffinton, P. G., "Earthquake Insurance in the United States -- A Reappraisal." Bulletin of the Seismological Society of America 51, (April, 1961), 315-329.

A discussion of the information needs of the earthquake insurance underwriter, including areas in which future research is needed.

132. Crumlish, Joseph D., "Some Economic Considerations in Evaluating Engineering Seismology Efforts." In: ESSA Symposium on Earthquake Prediction, U.S. Department of Commerce, Environmental Science Services Administration, Washington, D.C.: 1966, 119-122.

Compares earthquake damage in school buildings built before and after legislation requiring earthquake resistant construction for four California areas and for Seattle and Anchorage Schools.

133. Freeman, John R., Earthquake Damage and Earthquake Insurance: Studies of a Rational Basis for Earthquake Insurance, also Studies of Engineering-Resisting Construction. New York: McGraw-Hill, 1932, 904pp.

134. Friedman, Don G., "Computer Simulation of the Earthquake Hazard." In: Geologic Hazards and Public Problems: Conference Proceedings, edited by Robert A. Olson and Mildred M. Wallace. Office of Emergency Preparedness, Region Seven, Santa Rosa, California, 1969, 153-181. See also Friedman, D. G. and T. S. Roy, Computer Simulation of the Earthquake Hazard, Research Department Report, the Travelers Insurance Company, Hartford, Connecticut, May, 1969, 52pp.

Describes and tests a simulation of earthquake damage risk for use in establishing a workable earthquake insurance program.

135. Haas, J. Eugene, "Lessons for Coping with Disaster." In: The Great Alaska Earthquake of 1964: Human Ecology. National Academy of Sciences, National Research Council, Committee on the Alaska Earthquake, Washington, D.C.: 1970, 39-51.

Provides suggestions for community disaster planning gained from a field study of the Alaska earthquake, many of which apply to various kinds of disasters. Covers topics such as the warning system; supplemental and alternative communication; injury and damage assessment information, planning for search-and-rescue teams, providing for an Emergency Operations Center, and planning for the availability of resources, specialized information, and specialized equipment and skills.

136. Haas, J. Eugene and Robert S. Ayre, The Western Sicily Earthquake of 1968. National Academy of Sciences, Washington, D.C.: 1969, 70pp.
Report includes discussions of structural damage, medical problems, relief, transportation and communication, governmental decision-making, population movements, and general social, economic, and psychological effects of the disaster. Inadequacies in the relief and reconstruction programs are related to socio-economic and political conditions.
137. Hagiwara, T. and T. Rikitake, "Japanese Program on Earthquake Prediction." Science 157, (August 18, 1967), 761-768.
The program of earthquake prediction which resulted in the successful long-range forecast of the Matsushiro earthquakes is described. The response of the inhabitants to the earthquake warnings is briefly noted.
138. Heck, Nicholas Hunter, Earthquakes. New York: Hafner, 1955, 222pp.
General work on the causes and study of earthquakes, including chapters on Descriptions of Great Earthquakes and Safe Construction in Earthquake Regions.
139. Hodgson, John H., Earthquakes and Earth Structure. Englewood Cliffs: Prentice-Hall, 1964, 166pp.
Contains chapters on: What are Earthquakes Like, How Do Seismologists Study Earthquakes, Earthquakes Where and Why, and What Can We Do About Earthquakes.
140. Hollis, Edward P., Bibliography of Earthquake Engineering. Oakland, California: Earthquake Engineering Research Institute, 1971, (366 40th Street, Oakland, California 94609), 247pp.
An annotated bibliography divided into the following sections: Miscellaneous Sources of Data; Seismic Geology, Seismology, and Seismometry; Dynamics of Soils, Rocks, and Structures; Design and Construction in Seismic Regions; and Earthquake Damage. Contains numerous subsections. Author index. Cross-indexed.
141. Iacopi, Robert, Earthquake Country. Menlo Park, California: Lane Book Company, 1964, 191pp.
A semi-popular account of California's earthquake problem divided into two sections, "Why California has Earthquakes" and "Traveling Along California's Faults." Numerous photographs.

142. International Association for Earthquake Engineering, Tokyo, International Directory of Universities and Institutions Engaged in Earthquake Engineering Research 1970. Gakujutsu Bunken Fukyu-Kai: March, 1970, (c/o T.I.T. Oh-okayama, Meguro-ku, Tokyo 152, Japan), 126pp.

For each institution, provides complete address and phone number, and a list of personnel which includes their positions and research interests. Organized by country.

143. Joint Committee on the San Fernando Earthquake Study, Earthquake Risk: Conference Proceedings. Sponsored by the Joint Committee on Seismic Safety of the California Legislature, 1971, 151pp.

Includes articles on social benefits versus risk; decision-analysis in uncertain conditions; earthquake insurance; geologic hazards, risk and the decision-making process; costs and benefits of earthquake adjustments; liability resulting from earth movement; and others.

144. Kates, Robert W., "Human Adjustment to Earthquake Hazard." In: The Great Alaska Earthquake of 1964: Human Ecology. National Academy of Sciences, National Research Council, Committee on the Alaska Earthquake, Washington, D.C.: 1970, 7-31.

An analysis of the range of earthquake adjustments possible, actual adjustments practiced in Alaska before and after the earthquake and their adequacy, damage from the earthquake, the effect of the earthquake on earthquake adjustments, and implications for a national policy of reducing earthquake losses.

145. Kunreuther, Howard and Elissandra S. Fiore, The Alaskan Earthquake: A Case Study in the Economics of Disaster. Institute for Defense Analysis, Economic and Political Studies Division: February, 1966, 162pp.

A study of the immediate post-disaster recuperation, the long-term economic recovery, and the role of the federal government in the Alaskan Earthquake reconstruction. Some topics discussed are post-disaster organization, supply, and demand problems, external aids, labor migration patterns, public and private reconstruction, economic improvements, the Small Business Administration in Alaska, and the need for disaster insurance.

146. Lantis, Margaret, "Impact of the Earthquake on Health and Mortality," In: The Great Alaska Earthquake of 1964: Human Ecology. National Academy of Sciences, National Research Council, Committee on the Alaska Earthquake, Washington, D.C.: 1970, 77-89.

Discusses the types, causes and distribution of death, injury, and illness following the earthquake, the factors which kept the casualty rate unusually low, special medical problems in the disaster, medical record-keeping, and conclusions concerning medical planning for disasters.

147. Lomnitz, Cinna, "Casualties and Behavior of Populations During Earthquakes." Bulletin of the Seismological Society of America 60, (August, 1970), 1309-1313.

Studies of the relationship between time of day and casualties and the relationship between shocks and casualties in Chile lead to the inferences that it is safer, on the average, to be out-of-doors than indoors and that rapid evacuations of dwellings will reduce casualties.

148. Mukerjee, Tapan, Economic Analysis of Natural Hazards: A Preliminary Study of Adjustment to Earthquakes and Their Costs. Natural Hazards Research Working Paper No. 17. University of Toronto: 1971, 55pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

Contains a discussion of various adjustment to earthquakes and their costs, a discussion of costs and benefits of the adjustments, and a cost-benefit analysis of warning systems and structural modification for the city of San Francisco. Includes Bibliography on Earthquakes with Emphasis on Socio-economic Aspects.

149. National Academy of Sciences, Committee on Earthquake Engineering Research, Earthquake Engineering Research. Washington, D.C.: 1969, 313pp.

For each of the following topics, describes the present state of knowledge, need for future research and recommendations: Socioeconomic aspects of Earthquakes; Earthquake Ground Motion; Soil Mechanics and Earth Structure; Structural Dynamics Analysis; Structural Synthesis and Design; Coastal and Inland Waters; Utilities and Public Service Facilities; Post-Earthquake Inspection and Study; Foreign Cooperation; Education -- Requirements for the Future. Bibliography.

150. National Academy of Sciences, National Research Council, Committee on the Alaska Earthquake, The Great Alaska Earthquake of 1964: Human Ecology. Washington, D.C.: 1970, 510pp.

Contains 14 articles under the general headings: Implications of the Earthquake Experience, Selected Studies of Impacts and Behavior, Public Administration Aspects, and the Human Response in Selected Communities. Appendices Includes: Chronologies of Events in Anchorage Following the Earthquake; Statistical Studies of the Post-disaster Period; Basic Population and Employment Statistics, South Central Alaska, 1960-1967; Federal Disaster Act; Alaska Omnibus Act; and Amendments to Alaska Omnibus Act. Annotated Bibliography. See citations 129, 135, 144, 146, 155, 156, 306 in this bibliography for individual papers.

151. National Academy of Sciences, Toward Reduction of Losses from Earthquakes: Conclusions from the Great Alaska Earthquake of 1964. Washington, D.C.: 1969, 34pp.

Presents and briefly discusses the Committee on the Alaska Earthquakes' twelve recommendations on earthquake loss reduction measures, based on a review of the events before and after the Alaska Earthquake of 1964. Also includes recommendations from the Committee's panels on geology, seismology, hydrology, biology, oceanography, engineering, and geography.

152. Olson, Robert A. and Mildred M. Wallace, eds., Geologic Hazards and Public Problems: Conference Proceedings. Office of Emergency Preparedness, Region Seven, Santa Rosa, California, 1969, 335pp.

Contains 20 articles on various aspects of several geologic hazards, concentrating on earthquake hazard and the Pacific Coast region. See reference numbers 134, 157, 257, 311, 314, this bibliography.

153. Pakiser, L. C., J. P. Eaton, J. H. Healy and C. B. Raleigh, "Earthquake Prediction and Control." Science 166, (19 December, 1969), 1467-1474.

A review of the scientific literature on earthquake prediction and control and an evaluation of the probability of successful application.

154. Press, Frank and W. F. Brace, "Earthquake Prediction." Science 152, (June 15, 1966), 1575-1584.

A review of the state of the art of earthquake prediction, including instrumentation, theory, and research.

155. Rogers, George W., "Economic Effects of the Earthquake." In: The Great Alaska Earthquake of 1964: Human Ecology. National Academy of Sciences, National Research Council, Committee on the Alaska Earthquake, Washington, D.C.: 1970, 58-76. See also, Rogers, "Impact of the Earthquake on the Economy of Alaska," The Great Alaska Earthquake of 1964: Human Ecology, 32-38.

Uses population, employment, personal income, industry, resources, and state revenue data from 1960 through 1967 for various areas to trace the economic effects of the earthquake. On the whole, the economy benefitted but effects differed among communities and areas.

156. Selkregg, Lidia, Edwin B. Crittenden and Norman Williams, Jr., "Urban Planning in the Reconstruction." In: The Great Alaska Earthquake of 1964: Human Ecology. National Academy of Sciences, National Research Council, Committee on the Alaska Earthquake, Washington, D.C.: 1970, 186-239.

An analysis by community of the planning that took place after the earthquake, to what extent planning was implemented, and reasons for lack of or change in implementation. Concludes with suggestions for urban planning with regard to disasters and the proper role of federal and state government in that effort.

157. Steinbrugge, Karl V., Earthquake Hazard in the San Francisco Bay Area: A Continuing Problem in Public Policy. University of California, Berkeley: Institute of Governmental Studies, 1968, 80pp. See also "Earthquake Hazard Abatement and Land Use Planning: Directions Toward Solutions." In: Geologic Hazards and Public Problems: Conference Proceedings, edited by Robert A. Olson and Mildred M. Wallace. Office of Emergency Preparedness, Region Seven, Santa Rosa, California: 1960, 143-152.

Discusses public policy for reduction of earthquake loss in the Bay Area with regard to geologic faults, structurally poor ground, earthquake-induced landslides, seismic risk from vibrational sources, non-earthquake resistive construction, fire following an earthquake, and the role of specific governmental agencies in dealing with the earthquake problem.

158. _____, "Structural Damage, Soil Mechanics, and Foundation Engineering." In: ESSA Symposium on Earthquake Prediction, U.S. Department of Commerce, Environmental Science Services Administration, Washington, D.C.: 1966, 112-118.

Presents post-earthquake photographs and descriptions of buildings with various structural features in order to illustrate earthquake damage patterns and point to direction for future research. Some of the heavily-damaged structures were designed to be earthquake resistant.

159. United States Department of Commerce, Environmental Science Services Administration, Earthquakes. Washington, D.C.: 1969, 15pp.

A pamphlet containing a simple explanation of the cause and measurement of earthquakes, a world earthquake belt map, a seismic risk map of the United States, and a list of earthquake safety rules.

160. _____, A Preliminary Study of Engineering Seismology Benefits, by Joseph D. Crumlish and George F. Wirth. Rockville, Maryland: August, 1967, 46pp.

Analyzes the economic benefits from California's Field Act, which requires earthquake resistant school design and construction, and recommends further research in several areas of earthquake seismology. Includes a projection of earthquake engineering benefits and an earthquake resistant construction cost analysis.

161. United States Geological Survey, The Alaska Earthquake March 27, 1964, Lessons and Conclusions, by Edwin B. Eckel. USGS Professional Paper 546, Washington, D.C.: 1970, 57pp.

A summary of the effects of the earthquake, what was learned from the extensive post-earthquake research program, and what scientific investigations are needed to prepare for future earthquakes. Bibliography. Related reports dealing with various aspects of the damage are: Effects on the Alaska Railroad (545-D), Effects on the Alaska Highway System (545-C), Effects on Air and Water Transport, Communications and Utilities (545-B), and Effects on Various Communities (542-G).

162. United States Office of Science and Technology, Report of the Task Force on Earthquake Hazard Reduction: Program Priorities. Washington, D.C.: 1970, 54pp.

Presents and explains 28 major recommendations for earthquake hazard reduction, divided into three categories: benefits in less than five years, benefits between 5 and 10 years, and long-term benefits.

163. United States Senate, Committee on Public Works, Hearings, Governmental Response to the California Earthquake Disaster of February 1971. United States Senate, 92nd Congress, 1st Session, Washington, D.C.: 1971, 985pp.

Hearings were initiated because of complaints of governmental inefficiency and delay in response to the San Fernando Earthquake of 1971. Contains numerous letters, reports, and statements. No conclusions or recommendations drawn.

164. Waller, Roger M., Harold E. Thomas, and Robert C. Vorhis, "Effects of the Good Friday Earthquake on Water Supplies." Journal of the American Waterworks Association 57, (February, 1965), 123-131.

165. Wiegel, Robert L., Earthquake Engineering. Englewood Cliffs, New Jersey: Prentice-Hall, 1970, 518pp.
166. Wiggins, John H. Jr., and Donald F. Moran, Earthquake Safety in the City of Long Beach Based on the Concept of Balanced Risk. Palos Verdes Estates, California: J. H. Wiggins, Company, 1971, 43pp. See also shortened version in Perspectives on Benefit-Risk Decision Making, National Academy of Engineering, Washington, D.C.: 1972. Develops a system for designing building codes for a specified level of earthquake risk. The system includes input on type of use and length of building life, as well as geological factors. In addition, a structural hazard grading scheme and structure repair scheme for existing buildings is presented. Earthquake codes developed by fourteen countries, an explanation of the balanced risk aspect of the code, inspection procedures, remedial repair and a plan for post-earthquake operations are also discussed. Appendices include: Factors Influencing Earthquake Intensity, Structural Factors which Modify Intensity, Earthquake Risk Analysis Procedure, Factors Effecting Life Hazard, Summary of Fourteen Building Codes which Treat Earthquake, and A Model Ordinance for an Earthquake Building Code.
167. Working Group for Earthquake Research, Proposal for a Ten-Year National Earthquake Hazards Program. Office of Science and Technology and the Federal Council for Science and Technology, Washington, D.C.: 1968, 89pp. Outlines a national program for earthquake hazards research, including recommendations for expenditures.

FLOOD

168. Battalle-Columbus Laboratories, Flood Plain Management: An Approach for Ohio. Ohio Department of Natural Resources, 65 South Front Street, Columbus, Ohio 43215, August, 1971, 118pp. An analysis of socio-economic factors, technical factors and information resources affecting flood plain management. Socio-economic factors include public perception and attitudes, opportunity costs of flood plain regulations, and administrative powers of governmental officials and agencies. A community program for flood plain management is suggested, as well as recommendations for a state program to aid local governments.
169. Beuchert, Edward W., "State Regulation of Channel Encroachments." Natural Resources Journal 4, (January, 1965), 486-521. Presents an analysis of existing state of the law on channel encroachment. A model floodway encroachment act is proposed.

170. _____, A Legal View of the Floodplain. Harvard Law School, Cambridge, Massachusetts: 1961, 81pp. Reproduced by the TVA.

Briefly traces the history of channel encroachment and flood plain zoning laws. Drafts and comments on model legislation for each.

171. Bhavnagri, Viraf S., and George Bugliarello, "Flood Proofing in a Flood Plain: A Stochastic Model." Proceedings of the American Society of Civil Engineers, Hydraulics Division 92, (HY4, July, 1966), 63-76.

A mathematical model of an urban flood plain which incorporates a statistical description of flood proofing measures is presented. Both permanent and dynamic measures, i.e., contingent on the flood warning time, are considered.

172. _____, "Mathematical Presentation of an Urban Flood Plain." Proceedings of the American Society of Civil Engineers, Hydraulics Division 91, (HY2, March, 1965), 149-173.

Develops a mathematical model of damage susceptibility of various regions of the flood plain and incorporates this into a design procedure for determining the optimum size of an upstream flood control reservoir that would also take into account the effect of statistical fluctuation of damages and the time pattern of economic development.

173. Blum, Richard H. and Bertrand Klass, A Study of Public Response to Disaster Warnings. Stanford Research Institute, Menlo Park, California: 1956, 174pp.

Compares responses to evacuation warnings in three cities. Interviews, the analysis of weather records and reports, content analysis of media releases and subjective written accounts were used. The factors of the different community situations, source of warnings received, belief in the warnings, verification behavior, perception and subsequent evaluation of the situation, and other influences on the decision to evacuate are investigated. Appendices include: the questionnaires, a summary of press releases, tabulation and cross tabulation of responses, written accounts of personal reactions, and tabulation of responses to the second flood threat.

174. Brown, John P., Bruno Contini, and C. B. McGuire, "An Economic Model of Floodplain Land Use and Land Use Policy." Water Resources Research 8, (February, 1972), 18-32.

Develops a model that describes a landowner's choice of land use in a flood plain as a function of the probability of a flood when the criterion is expected present value. Four simple benefit stream patterns are considered. The relationship between the benefits of flood control and damage reduction is shown. The model provides a framework for comparing disparate flood relief and control policies. The misallocative effects of simple flood relief policies are demonstrated.

174. Burton, Ian and Robert W. Kates, "The Flood Plain and the Seashore: A Comparative Analysis of Hazard-zone Occupance." Geographical Review 54, (1964), 366-385.

A comparison of coastal and riverine flood hazard in terms of hydrological features, geomorphic features, role of engineering works in hazard zone occupance, and advantages of the hazard areas for human occupance.

176. Burton, Ian, Types of Agricultural Occupance of Flood Plains in the United States. University of Chicago Department of Geography Research Paper No. 75, Chicago: 1962, 167pp.

Hypotheses were developed for relationships between: 1) width of flood plain and land use, 2) width of flood plain and farm buildings, 3) slope of adjoining land and flood plain land use, 4) slope of adjoining land and farm buildings, 5) flood frequency and land use, 6) flood frequency and farm buildings, and 7) seasonality of flooding and flood plain land use. Groupings of these variables form descriptions of flood plain occupance. Five occupance types were found in twelve study areas chosen for heterogeneity of farming types and the variables considered, and some hypotheses were verified. Implications for public policy are discussed. Appendix: Theoretical Occupance Types.

177. _____, "Invasion and Escape on the Little Calumet." In: Papers on Flood Problems, edited by Gilbert F. White, University of Chicago Department of Geography Research Paper No. 70, Chicago: 1961, 84-91.

Interviews on flood expectancy, knowledge, and experience were given to residents of Hammond and Munster, Indiana, comparable to a previous interview study of Topeka (see reference No. 227 in this bibliography). Although the Munster-Hammond area has differing flood hazard, socio-economic distribution, and flood plain development pattern, the results of this study generally support the previous study.

178. Chow, Ven Te, Handbook of Applied Hydrology. New York: McGraw-Hill, 1964, approximately 1400pp.

A comprehensive handbook dealing with sciences related to hydrology, hydrologic phenomena, practice and application of hydrology, and socio-economic aspects of hydrology. Numerous references follow each of 29 sections. Under the category of socio-economic aspects are sections on water resources planning and development, water law, water policy, and applications of electronic computers in hydrology.

179. Cypra, Kenneth and George L. Peterson, Technical Services for the Urban Floodplain Property Manager: Organization of the Design of the Problem. Natural Hazards Research Working Paper No. 12, Univeristy of Toronto: 1969.

Discusses technical advice services for flood plain managers based on the assumption that "services are simultaneously limited from above by the flood plain management effort and its supporting state of the art and below by the recipient's attitude towards such service."

180. Danzig, Elliott R., Paul W. Thayer, and Lila R. Galanter, The Effects of a Threatening Rumor on a Disaster-Stricken Community. Disaster Study No. 10, Washington, D.C.: National Academy of Sciences, National Research Council, 1958, 116pp.

A study of the behavior of the population in a flood stricken community in response to a rumor that the dam had broken. First, a descriptive account of the rumor communication network and communication of denial was prepared from interviews of officials. Second, a random sample of city residents and a saturation sample from the previously flooded area were interviewed. Data is presented on variables related and not related to flight behavior, respondents reactions to rumor and denials, confirmation behavior, flight behavior, credibility of sources, etc.

181. Day, John C., "A Recursive Programming Model for Nonstructural Flood Damage Control." Water Resources Research 6, (October, 1970), 1262-1272. See also An Activity Analysis of Nonstructural Floodplain Management Alternatives, University of Wisconsin Water Resources Center, Hydraulic and Sanitary Laboratory, Madison, Wisconsin 53706, 1969, 121pp.

Presents a computational technique for evaluating land use alternatives based on the economic value a community gains from its land. A linear programming model is developed that identifies economically efficient combinations of: 1) spatial and temporal planning of urban land use, 2) site elevation through landfill, and 3) flood proofing of buildings.

182. Day, J. H., H. P. Ho and V. T. Houghton, "Evaluation of Benefits of a Flood Warning System." Water Resources Research 5, (1969), 937-946.

Benefits from a flood warning system are estimated using individual structure damage curves for several warning periods. Data for residences, a grocery supermarket, and a railroad switchyard are used. The application of this technique to a 1959 flood indicates the extent of reducible damage. Evacuation and temporary flood proofing may also be evaluated by this method.

183. Dempsey, Clyde R., The Effects of Geographical and Climatic Setting on the Economic Advantages of Alternative Flood Control Measures. University of Kentucky Water Resources Institute, Lexington, Kentucky: 1968, 166pp.

Using the Stanford Watershed Model, a sensitivity test of flood control measures to climate and geographic location was made by comparing the results of the Planning Program between two different watersheds.

184. Dunham, Allison, "Flood Control via the Police Power." University of Pennsylvania Law Review 107, (1959), 1098-1132.

The history of flood plain zoning is examined, and a conceptual framework for legal problems of zoning is set forth. The constitutional basis for the use of police power in land use regulation to promote flood control is analyzed.

185. Eckstein, Otto, Water-Resource Development: The Economics of Project Evaluation. Cambridge: Harvard University Press, 1961, 300pp.

Following an outline of the general theoretical basis of benefit-cost analysis, the procedures for measuring benefits and costs employed by the Bureau of Reclamation and the Army Corps of Engineers are analyzed for flood control, irrigation, navigation, and electric power. The present extent of cost sharing by the beneficiaries is explored together with the amount of local charges that economic analysis suggests. Principles and techniques by which joint costs can be allocated are discussed.

186. "Flood Plain Zoning for Flood Loss Control." Note, Iowa Law Review 50, (1965), 552-581.

Sets forth practical and legal considerations for the purpose of drafting flood plain regulations.

187. Goddard, James E., "Flood Plain Management Improves Man's Environment." Proceedings of the American Society of Civil Engineers, Waterways and Harbours Division 89, (WW4, November, 1963), 67-84.

Uses TVA flood control programs to illustrate how a comprehensive flood control program utilizing a variety of adjustments is desirable.

188. Grossman, David A., "Flood Insurance: Can A Feasible Program be Created?" Land Economics 34, (1958), 352-357.

Discusses the reasons for the failure of the 1965 Flood Insurance Act and offers suggestions for policy changes in future flood insurance programs.

189. Hart, Henry C., "Crisis, Community, and Consent in Water Politics." Law and Contemporary Problems 22, (1957), 510-537.

Discusses the problem that water policy is usually enacted as a response to a crisis, through which consent is gained for programs which are often poorly planned. This situation is exacerbated by the fact that river basins do not correspond to political boundaries. The Army Corps of Engineers as a crisis agency is also discussed.

190. Hinote, Hubert, Benefit-Cost Analysis for Water Resource Projects: A Selected Annotated Bibliography. University of Tennessee, Center for Business and Economic Research, Knoxville: 1969, 148pp.

Provides detailed annotation, in some cases several paragraphs long. Citations are divided into sections on basic works, flood control, navigation, water quality (pollution) control, recreation, water supply, land value enhancement, and related bibliographies; then divided into subtopics. Forty-five references on flood control. Author index and index of government and agency publications.

191. Hirshleifer, Jack, James C. De Haven, and Jerome W. Milliman, Water Supply: Economics, Technology, and Policy. Chicago: University of Chicago Press, 1960. 386pp.

Contents: The Water Problem; Our Water Resources: The Present Picture; The Economics of Utilization of Existing Water Supplies; Criticisms of Market Allocations: The Political Allocation Process; Municipal Water Rates; Investment in Additional Water Supplies; The Practical Logic of Investment Efficiency Calculations; Technological Features and Costs of Alternative Supplies of Water; Water Law: Government Discretion or Property Rights?: New York's "Water Crisis": Case Study of a Crucial Decision; Water for Southern California: Case Study of an Arid Region: Some Controversial Conclusions and Their Implications.

192. Hogan, R. M., "State Flood-Plain Zoning." DePaul Law Review 12, (1963), 246-262.
Reviews major cases and legal issues in flood plain zoning. Discusses ability and authority of federal, state, and local governments to legislate and enforce flood plain zoning, with the conclusion that the state level is most efficient for this purpose.
193. Holmes, Roland C., "Composition and Size of Flood Losses." In: Papers on Flood Problems, edited by Gilbert F. White, University of Chicago Department of Geography Research Paper No. 70, Chicago: 1961, 7-20.
An analysis of changes in damage caused by catastrophic and ordinary floods between 1903 and 1958.
194. Homan, A. Gerlof and Bruce Waybur, A Study of Procedure in Estimating Flood Damage to Residential, Commercial and Industrial Properties in California. Stanford Research Institute, Menlo Park, California: 1960, 53pp.
Discusses the results of a study of the effectiveness of water depth, value of content and value of structure in estimating flood damage for residential, commercial, and industrial properties.
195. Hoyt, William G. and Walter B. Langbein, Floods. Princeton, New Jersey: Princeton University Press, 1955, 469pp.
A classic on adjustments to floods. Chapters include: Why We Have Flood Problems; Life History of a Flood; Damage from Floods; Man's Adaptation to Floods; Protection through the Control of Water; Floods and the Constitution; Our Present Flood-Control Policy; Basin Problems, Projects, and Plans; and Flood History.
196. Institute for Water Resources, A Computer Simulation Model for Flood Plain Development Part 1: Land Use Planning and Benefit Evaluation by INTASA, N. V. Arvanitidis, project manager. U. S. Army Corps of Engineers, February 1972, 84pp. Available from National Technical Information Service, Department of Commerce, Springfield, Virginia 22141.
197. _____, Analysis of Alternative Procedures for the Evaluation of Agricultural Flood Control Benefits, 2 Volumes, by the Economic Research Service of the U.S. Department of Agriculture, Daniel Piper, Roger Strohbehn, and Robert Boxley. U.S. Army Corps of Engineers, July, 1971, 117pp. Available from National Technical Information Service, Department of Commerce, Springfield, Virginia 22151.
An evaluation of a regional linear programming model for estimating the benefits of flood reduction to agricultural crops.

198. _____, Agricultural Flood Control Benefits and Land Values, edited by Raymond J. Struyk. U.S. Army Corps of Engineers, June, 1971, 132pp. Available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

A study on agricultural land value as effected by flood control works, tailored to aid Corps of Engineers personnel in future estimation of flood control benefits. The methodological framework was taken from citation No. 200, this bibliography. The framework is applied to the Wabash and Missouri River Basins.

199. _____, Preliminary Review and Analysis of Flood Control Project Evaluation Procedures, by N. V. Arvanitidis, R. C. Lind, J. Rosing, and G. P. Johnson of INTASA. U.S. Army Corps of Engineers, September, 1970, 112pp. Available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151.

Examines theory, definition, and measurement of the land enhancement effects arising from flood protection.

200. _____, The Relationship Between Land Values and Flood Risk in the Wabash River Basin, by Robert F. Boxley. U.S. Army Corps of Engineers, December, 1969, 165pp. Available from National Technical Information Service, Department of Commerce, Springfield, Virginia 22151.

Examines the usefulness of land values as a measure of benefits from flood protection to agricultural areas. A theoretical model is produced and applied to three river areas with different flood plain characteristics. The results are compared with benefit estimates using synthetic hydrology.

201. Instituut voor Sociaal Onderzoek van het Nederlandse Volk, Studies on Holland Flood Disaster 1953, Volume 1, "Communications in the Stricken Area in February, 1953," by K. van Dijk and J. Pilger. National Academy of Sciences, National Research Council, Washington, D.C.: 1955, 86pp.

The study is divided into two parts. The first is a descriptive study of the mechanical breakdown of the normal communication system, the establishment of an emergency system, and the restoration of normal communication. The second, an interview study dealing with the social consequences of lack of communication, compares areas where people were evacuated to areas where there was no evacuation and compares areas in which the disaster came suddenly to areas where it came slowly. The interviews covered: 1) warning and initial communication, 2) general situation during isolation, and 3) rumors, supply of news. This volume also contains an introduction which describes the study as a whole and the disaster.

202. _____, Studies in Holland Flood Disaster 1953, Volume 2, "Survey of Evacuation Problems and Disaster Experiences," by C. J. Jammers. National Academy of Sciences, National Research Council, Washington, D. C.: 1955, 234pp.

Part I is a study of level of tension between host and evacuee three months after the disaster by interview and six months later by questionnaire. Variables such as length of stay, housing conditions, income and class differences, religious-political differences, composition of families, kinship or friendship and previous evacuation experience were statistically investigated. Part II is a similar study of evacuees "at homeness" in his host community. Part III is an evaluation of various sources of relief. Part IV charts the victims disaster experience: source and reaction to warning, actions during the disaster, physical circumstances, etc. Appendices include interview schedule and questionnaire, discussion of sample and statistical tests, and bibliography.

203. _____, Studies in Holland Flood Disaster 1953, Volume 3, "A study of Community Re-integration," by L. W. Nauta and P. J. Strien, "A Study of the Destruction of a Community," by J. E. Ellemers and Henny M. in't Veld-Langeveld and "A Study of Social Disorganization in a Community," by M. Jeanne van Doorn-Janssen." National Academy of Sciences, National Research Council, Washington, D.C.: 1955, 213pp.

The first study describes psychological responses to the disaster and reconstruction through interviews and direct observation. The second is an interview study of the psychological and social consequences of the disaster to a community which had to be completely evacuated. The third is a study of the class conflicts that had arisen or intensified and the social organization as it had been changed by the events of the disaster and the relief effort.

204. _____, Studies in Holland Flood Disaster 1953, Volume 4, "General Conclusion," by J. E. Ellemers. National Academy of Sciences, National Research Council, Washington, D.C.: 1955, 95pp.

An organization and summary of the conclusions gained from the studies reported in the first three volumes.

205. James, L. D., "Economic Analysis of Alternative Flood-Control Measures." Water Resources Research 3, (1967), 333-343. See also, James, L. D., A Time-Dependent Planning Process for Combining Structural Measures, Land Use, and Flood Proofing to Minimize the Economic Cost of Floods. Report EEP-12, Institute of Engineering-Economic Systems, Stanford University: 1964.

A computer program was developed for determining the optimum combination of structural and non-structural measures for flood control according to the criterion of economic efficiency. The program relates optimum combinations of channel improvement, flood proofing and land use control for each portion of the flood plain during planning stages of specified duration to specific flood plain during planning stages of specified duration to specific flood plain properties. Total cost of the optimum program and a sensitivity analysis was related to variation in cost of channel improvement, cost of land use control, cost of flood proofing, right-of-way value, relationship between flood damage and flood severity, value of open space, extent of aversion to irregular timing of flood damage, discount rate, population projections, and the exclusion of alternative combinations.

206. _____, "Nonstructural Measures for Flood Control." Water Resources Research 1, (1965), 9-24. See also, James, L. D., A Time-Dependent Planning Process for Combining Structural Measures, Land Use, and Flood Proofing to Minimize the Economic Cost of Floods. Report EEP-12, Institute of Engineering-Economic Systems, Stanford University: 1964.

A procedure is presented for establishing a combination of structural measures, flood proofing, locational adjustment and damage absorbing to be applied in various proportions over time which satisfies the economic efficiency criterion. The technique was used to analyze a small watershed. Advantages of nonstructural measures and advantages of stage construction are discussed.

207. _____, "Using a Digital Computer to Estimate the Effects of Urban Development on Flood Peaks." Water Resources Research 1, (1965), 223-234.

A computer program based on water balance methods was used to develop a long-term continuous hydrograph for a creek. By varying constants describing the physical condition of the watershed according to amount of urban development and channel improvement, a number of hydrographs were developed which made possible an estimate of flood peak by percentage of urbanized area, percentage of channels improved, and tributary area. The effect of urbanization on runoff volume and distribution during the year was also investigated.

208. Kates, Robert W. and Gilbert F. White, "Flood Hazard Evaluation." In: Papers on Flood Problems, edited by Gilbert F. White, University of Chicago Department of Geography Research Paper No. 70, Chicago: 1961, 135-148.

Contains an analysis of the present state of the art of flood hazard evaluation and a guide for setting zoning regulation lines that are relatively easy to determine and understand. An example of the zoning guide applied to La Porte St., Plymouth, Indiana is included.

209. Kates, Robert W., Industrial Flood Losses: Damage Estimation in the Lehigh Valley. University of Chicago Department of Geography Research Paper No. 98, Chicago: 1965, 76pp.

An analysis of the problems in determining and projecting flood losses is presented, based upon previous estimates of damage in the Lehigh Valley. A methodology for developing ideal synthetic stage damage functions is discussed. Using this methodology an analysis of 17 Lehigh Valley industrial firms is presented which includes four types of adjustment, two national and two establishment economic assumptions, and twelve degrees of flooding. The synthetic damage estimates are compared to recorded damages. Implications for flood damage estimation are discussed.

210. _____, Hazard and Choice Perception in Flood Plain Management. University of Chicago Department of Geography Research Paper No. 78, Chicago: 1962, 157pp.

Discusses the paradox that greater flood control leads to greater flood damages; also discusses resource problems and decision-making. Extensive interviewing of commercial managers and residents in LaFollette, Tennessee and reconnaissance studies of five other communities of differing geographical and socio-economic circumstances revealed several types of perception of flood hazard which differed from the scientific model. Greater variation of both perception and adjustments was found in areas of less perceived certainty of flood occurrence. The role of information in perception and adjustment is discussed. Appendix: Commercial Questionnaire.

211. Kollmorgen, Walter M., "Settlement Control Beats Flood Control." Economic Geography 29, (1953), 208-215.

Reviews some army Corps of Engineers flood control works in which the damages prevented were less than the cost of the program for a number of reasons. Discusses aspects of cost-benefit analysis of flood control which render the analysis inaccurate, such as failure to consider flood-caused soil improvement, disturbed hydrological conditions accompanying flood control works, mythical navigation benefits, etc. Suggests alternative adjustments to dams.

212. Krutilla, John V., "An Economic Approach to Coping with Flood Damage." Water Resources Research 2 (1969), 183-190.

Discusses the feasibility of, and advantages of, a compulsory flood insurance program.

213. Krutilla, John V. and Otto Eckstein, Multiple Purpose River Development: Studies in Applied Economic Analysis. Johns Hopkins, Baltimore: 1958, 301pp.

Part I contains the following chapters: Statement of the Problem; The Concept of Economic Efficiency; Market Mechanics, River Basin Development, and Efficiency; and the Social Cost of Federal Financing. Part II is five selected case studies and a chapter on policy implications.

214. Langbein, W. B., "Flood Insurance." Land Economics 29, (1953), 323-330.

Presents a case for the desirability and feasibility of federal flood insurance.

215. Lind, Robert C., "Flood Control Alternatives and the Economics of Flood Protection." Water Resources Research 3, (1967), 345-357.

Discusses and compares the economic effects of alternative programs for coping with flood losses. Special emphasis is placed on flood insurance and land enhancement benefits.

216. _____, The Nature of Flood Control Benefits and the Economics of Flood Protection. Division of Engineering-Economic Systems, Stanford University. 1966, 104pp.

Discusses the nature of benefits from flood prevention and five basic means for coping with flood losses; develops a land use model and uses it to measure the benefits from the introduction of flood control; and discusses the feasibility of flood insurance from an economic standpoint.

217. Lee, Robert R., Gerald A. Fleischer and Vincent J. Roggeveen, Engineering-Economic Planning of Water Resources: A Selected Bibliography. Stanford University Project on Engineering-Economic Planning, Stanford, California: 1961, 84pp.

Contains 827 citations under the headings:

Bibliographies; Administration; Policy and Planning; Case Studies; Economic Considerations: Cost Allocation and Repayment; Economic Considerations: Evaluation; Economic Considerations: Financing; Economic Considerations: Rates; Economic Considerations: General; Flood Control; Law; Pollution; Regional Studies; Supply and Uses; General.

218. Leuchtenburg, William Edward, Flood Control Politics: The Connecticut River Valley Problem 1927-1950. Cambridge: Harvard University Press, 1953, 325pp.

Traces the history of flood control politics in the Connecticut River Valley from 1927-1950, and assesses the political causes of inadequate flood control.

219. Loughlin, James C., "A Flood Insurance Model for Sharing the Costs of Flood Protection." Water Resources Research 7, (1971), 236-244.

A cost sharing model complimentary to the 1968 flood insurance act for structural flood protection programs is proposed, related to savings in flood insurance premiums.

220. Maass, Arthur, Maynard M. Hufschmidt, Robert Dorfman, Harold A. Thomas, Jr., Stephen A. Marglin, and Gordon Maskew Fair, Design of Water-Resource Systems: New Techniques for Relating Economic Objectives, Engineering Analysis, and Governmental Planning. Cambridge: Harvard University Press, 1962, 620pp.

Chapters: Objectives of Water Resource Development: A General Statement; Basic Economic and Technologic Concepts: A General Statement; Economic Factors Affecting System Design; Application of Basic Concepts; Graphic Techniques; Methods and Techniques of Analysis of the Multiunit, Multipurpose Water Resource System: A General Statement; A Simplified River Basin System for Testing Methods and Techniques of Analysis; Conventional Methods of Analysis; Analysis by Simulation: Programming Techniques for a High Speed Digital Computer; Analysis by Simulation: Examination of Response Surface; Operating Procedures: Their Role in the Design of Water Resource Systems by Simulation Analyses; Mathematical Synthesis of Streamflow Sequences for the Analysis of River Basins by Simulation; Mathematical Models: The Multistucture Approach; Mathematical Models: A Stochastic Sequential Approach; System Design and the Political Process: A General Statement.

221. Maass, Arthur, Muddy Waters: The Army Corps of Engineers and the Nation's Rivers. Cambridge: Harvard University Press, 1951, 306pp.

The Corps of Engineers procedures for planning water development projects are examined in light of criteria of administrative responsibility advanced in the introduction. A detailed case study illustrates the causes and results of uncoordinated water resource development.

222. McKean, Ronald N., Efficiency in Government Through Systems Analysis with Emphasis on Water Resources Development. New York: Wiley, 1958.

Purpose of the book is to "draw up some constructive suggestions for the preparation and use of cost-benefit analysis" and "to stimulate the increased use of better analysis in connection with other government activities."

223. Murphy, Francis C., Regulating Flood-Plain Development. University of Chicago Department of Geography Research Paper No. 56, Chicago: 1958, 204pp.

224. A study of flood plain regulation to determine what is necessary and practicable in the reduction of urban flood losses, based upon a critical review of published information; conferences with administrators, planners, and engineers at local, state, and federal levels; interviews with those whose business, profession, or financial position is affected by floods; field inspection of areas with and without legislation regulation flood plain development; and extensive correspondence. Discusses and evaluates present and possible means of flood loss reduction with more extensive discussion of statutes, channel encroachment provisions, zoning ordinances, and subdivision regulations. Concludes with policy recommendations. Two appendices: Channel Encroachment Provisions in Statutes, and Flood Plain Provisions in Zoning Ordinances.

224. Rachford, Thomas M., Economic Analysis of Alternative Flood Control Measures by Digital Computer. University of Kentucky Water Resources Institute, Lexington, Kentucky: 1966, 157pp.

A digital computer program for selecting the optimum combination of flood proofing, flood plain land use, channel improvement and residual flood damage for a given flood plain. The optimum policy is based on economic efficiency and is selected for each planning unit of the flood plain for each planning stage. Using this program a number of sensitivity studies based on data for the Morrison Creek Watershed near Sacramento are presented.

225. Renshaw, Edward F., "The Relationship Between Flood Losses and Flood-Control Benefits." In: Papers on Flood Problems, edited by Gilbert F. White, University of Chicago Department of Geography Research Paper No. 70, Chicago: 1961, 21-45.

Adjustment to the flood hazard is discussed within the context of optimal economic development, development entailing social cost of secondary flooding, and factors contributing to general overinvestment in the flood plain. A discussion of why benefits of flood control are often over or underestimated is followed by a "six point program for improving loss estimates."

226. _____, Toward Responsible Government: An Economic Appraisal of Federal Investment in Water Resource Programs. Chicago: Idylia Press, 1957, 164pp.

Chapters are: Towards a National Reclamation Policy, Reclamation and the American Sugar Policy, Economic Aspects of Public Power, A Flood Damage Model for the United States, The Measurement of the Benefits from Public Investment in Navigation Projects, An Appraisal of the Department of Agriculture's Flood Prevention and Water Protection Program, The Theoretical Framework for Appraising Public Investment, Problems Involved in Appraising Public Investment in Irrigation, An Empirical Appraisal of Historical Investment in Reclamation, An Appraisal of Contemporary Public Investment in Irrigation, An Economic Appraisal of Reclamation Investments Made by the Corps of Engineers, Secondary, and Public Benefits from Public Investment in Irrigation, Cross-Sectional Pricing in the Market for Irrigated Land.

227. Roder, Wolf, "Attitudes and Knowledge on the Topeka Flood Plain." In: Papers on Flood Problems, edited by Gilbert F. White, University of Chicago Department of Geography Research Paper No. 70, Chicago: 1961, 62-83.

A sample of 103 residents and business people in the Topeka Flood Plain in areas of high, intermediate, and low flood risk were interviewed on flood experiences and expectancies before or after the newspaper publication of a U.S. Geological Survey flood map. A number of bankers, officials of savings and loan associations, and real estate dealers were also interviewed. Among the findings are: 1) knowledge of protective works does not influence expectancy of future flooding, 2) past experience influences people's flood expectancies, 3) being flooded is a weak deterrent to choosing a subsequent home on the flood plain, 4) the flood map had very little effect upon even "key" persons who are involved in flood plain planning, and 5) those influential in flood plain management possess limited knowledge of the flood hazard but are confident of the adequacy of their information. A model of flood plain succession is supported by the history of the effects of a severe Topeka flood in 1951.

228. Roder, Wolf and Brian J. L. Berry, "Associations Between Expected Flood Damages and the Characteristics of Urban Flood Plains: A Factorial Analysis." In: Papers on Flood Problems, edited by Gilbert F. White, University of Chicago Department of Geography Research Paper No. 70, Chicago: 1961, 46-61.

104 cities of over 1,000 population and having serious flood problems were chosen on the basis of availability of information on 24 variables concerning flood damage, geography, flood hazard, socio-economic variables, and flood adjustments. Factor analysis revealed four basic patterns, three of them related to expected damage.

229. Sheaffer, John Richard, Flood Proofing: An Element in a Flood Damage Reduction Program. University of Chicago Department of Geography Research Paper No. 65, Chicago: 1960, 198pp.

After a review of flood proofing methods, a geographical and socio-economic field study of the urban community of Bristol, Tennessee-Virginia is presented. Perceptions of businessmen to the local flood hazard are discussed. The potential for flood loss in Bristol is estimated by comparing various kinds of structures in Bristol to the results of an extensive TVA Chattanooga flood damage survey. From this basis, the results of a cost-benefit analysis of flood proofing for twenty-four sample businesses are presented for three flood intensities and three methods of financing. The applicability of flood proofing is discussed in relation to: other adjustments; regional geography; accurate flood forecasting; technical guidance; financing; flood plain regulations, and legal aspects.

230. Struyk, Raymond J., "Flood Risk and Agricultural Land Values: A Test." Water Resources Research 7, (August, 1971), 789-797.

A multiple linear regression technique is used to control for non-flood factors affecting land values in order to measure the capitalized damages to agricultural land resulting from flooding. The model is applied to an area on the Missouri River, and the results compared with other measures of flood risk.

231. Task Force on Federal Flood Control Policy, A Unified Program for Managing Flood Losses. 89th Congress, 2nd Session, House Document 465. Washington, D.C.: USGPO, 1966, 47pp.

Outlines recommendations for a federal flood management program covering the improvement of basic knowledge, coordinated and planned flood plain developments, technical services to flood plain managers, insurance, and adjusting federal flood control policy to sound criteria and changing needs. Includes discussions of: "What is Happening on the Nation's Flood Plains" and "Principles Bearing on the Problem of Flood Damages."

232. Task Force on Flood Plain Regulations, "Guide for the Development of Flood Plain Regulations." Proceedings of the American Society of Civil Engineers, Hydraulics Division 88, (HY5, September, 1962), 73-119.

This report is primarily for the use of engineers who are not familiar with the field of planning and zoning. "It outlines data required by planners and officials in considering the most reasonable solution of flood problems. The relationships and responsibilities of the various levels of government are stated and the processes involved in the preparation and adoption of regulations are considered." Appendices: Glossary, Excerpt from pertinent ordinances and regulations, Bibliography.

233. Task Force on Effect of Urban Development on Flood Discharges, "Effect of Urban Development on Flood Discharges." Proceedings of the American Society of Civil Engineers, Hydraulics Division 95, (HY1, January, 1969), 287-309.

After a brief discussion of the topic and suggestions for future research, an annotated bibliography of approximately 80 citations and a list of current research projects are presented.

234. Tennessee Valley Authority Technical Library, Flood Damage Prevention: An Indexed Bibliography, sixth edition. Knoxville: July, 1969, 43pp.

Contains 407 citations grouped according to date of publication from 1920 to 1969. Includes many government documents and special reports. Cross-indexed by 23 categories.

235. Theiler, Donald F., "Effects of Flood Protection on Land Use in the Coon Creek, Wisconsin Watershed." Water Resources Research 5, (1969), 1216-1222.

In justification of a flood control program, the intensified use of agricultural land resulting from increased flood protection was assumed. An investigation of land use after the protective works were built revealed only slight change in land use. Most land use changes appeared the result of socio-economic factors.

236. United States Department of Agriculture, First Aid for Flooded Homes and Farms. Agricultural Handbook No. 38. Washington, D.C.: 1970, revised, 31pp.

A fairly detailed report on how to clean up and repair flood damage to home, household belongings, and farm equipment.

237. United States Department of Commerce, Environmental Science Services Administration, A Plan for Improving the National River and Flood Forecast and Warning Service. Silver Spring, Maryland: December, 1969, 64pp.

Outlines the present (1969) program and planned improvements which include, among other things, improved preparation and dissemination of flood forecasts and warnings, extending flash flood warnings to new locations, increased data acquisition, and providing advanced training for personnel. Includes charts on Loss of Life and Property in the United States from Floods, and Reduction of Flood Losses by Actions Based on River Forecasting.

238. United States Department of Housing and Urban Development, "Title XIII -- National Flood Insurance." Summary of the Housing and Urban Development Act of 1968, Washington, D.C.: 1968, 69-80.

A summary of the National Flood Insurance Act.

239. United States President's Water Resources Council, Policies, Standards, and Procedures in the Formulation, Evaluation, and Review of Plans for Use and Development of Water and Related Land Resources. 87th Congress, 2nd Session, Senate Document 97, Washington, D.C.: 1962, 13pp.

Outlines objectives, policies, standards and procedures for the planning of water resources development. Emphasizes comprehensive planning which includes state, national, and local interests, and takes into consideration both tangible and intangible costs and benefits.

240. United States President's Water Resources Policy Commission Report, A Water Policy for the American People. Washington, D.C.: 1950, 445pp.

A report on recommendations for a comprehensive national water resources policy, including the extent and character of Federal government participation in major water resources programs, an appraisal of the priority of water resources programs from a standpoint of economic and social needs, criteria and standards for evaluating the feasibility of projects, and desirable legislation or changes in existing legislation.

241. United States Senate, Committee on Banking and Currency, Insurance and Other Programs for Financial Assistance to Flood Victims. 89th Congress, 2nd Session, September, 1966, 140pp.

Background information on flood insurance is presented and a recommended program involving private flood insurance with major federal help is presented.

242. United States Senate, Select Committee on National Water Resources, Floods and Flood Control. 86th Congress, 2nd Session, Committee Print No. 15, Washington, D.C.: 1960, 77pp.

Reviews the flood damage problem in the United States, possible adjustments, historical and legislative background, the effect of flood control programs, their relationship to other phases of water resource development, an appraisal of federal flood control activities, and recommendations for improvement in federal flood control programs. Twenty-three tables and figures on flood damage and flood control efforts.

243. United States Water Resources Council, Regulation of Flood Hazard Areas to Reduce Flood Losses. Washington, D.C.: 1971, 578pp.

Part 1, Conclusions, is based on the studies contained in Parts 2-6. A bibliography is included. Part 2 contains three draft statutes, with commentary, to enable a state agency to: a) regulate flood hazard areas in conjunction with local units, b) regulate flood hazard areas independent of local units, and c) to aid local units in regulating flood hazard areas. Part 3 discusses general and specific legal considerations. Part 4 discusses local riverine flood zoning ordinances and sets out alternative ordinances with commentary. Part 5 discusses and sets out a draft of subdivision regulations. Part 6 discusses management for coastal flood loss control and includes draft coastal zoning regulations.

244. Weber, Eugene and Walter G. Sutton, "Environmental Effects of Flood Plain Regulations." Proceedings of the American Society of Civil Engineers, Hydraulics Division 91, (HY4, July, 1965), 59-70.

After a short review of trends in national flood plain losses, the status of flood plain regulation and programs providing information for regulation planning are reviewed.

245. Whipple, William, "Optimum Investment in Structural Flood Control." Proceedings of the American Society of Civil Engineers, Hydraulics Division 94, (HY6, November, 1968), 1507-1515.

Discusses the problem that project induced damages due to increased occupation of the flood plain renders traditional cost-benefit analysis misleading.

246. White, Gilbert F., "Recent Developments in Flood Plain Research." Geographical Review 60, (1970), 440-443.

An overview of the most important recent developments in flood plain research.

247. _____, "Optimal Flood Damage Management: Retrospect and Prospect." In: Water Research, edited by Allen V. Knesse and Stephen C. Smith, Johns Hopkins, Baltimore: 1966, 251-269.

A review of what has been learned about flood damage management, what still needs to be learned, and what conclusions can be drawn from our present knowledge about warranted public action.

248. _____, Choice of Adjustment to Floods. University of Chicago Department of Geography Research Paper No. 93. Chicago: 1964, 149pp.

An examination of conditions in which managers of flood plain property choose among eight possible adjustments, based upon intensive study of La Follette, Tennessee and reconnaissance study of five other towns differing widely in physical characteristics of flooding. Factors affecting the path which adjustment takes from the first use of flood plain land include perception of the possible adjustments, technical feasibility of particular adjustments, the economic efficiency of these choices, and the timing and incidence of decisions by the private and public managers. Implications for public policy are discussed. Includes two appendices: The Economic Effect of Local Flood Protection Measures by John Eric Edinger, and Form for Estimating Flood Losses and Adjustment Costs.

249. _____, ed., Papers on Flood Problems. University of Chicago Department of Geography Research Paper No. 70, Chicago: 1961, 221pp.

Includes thirteen original papers on or related to flood problems under the categories: Flood Losses and Flood Plain Occupance, Flood Characteristics, and Regulating Land Use. See numbers 177, 193, 225, 227, 228, in this bibliography for references to some of the individual papers.

250. _____, Changes in Urban Occupance of Flood Plains in the United States. University of Chicago Department of Geography Research Paper No. 57, Chicago: 1958, 235pp.

A study of changes in urban occupance of flood plains between 1936 (when the Flood Control Act was enacted) and 1957, based on intensive studies of seventeen flood plain areas. In each case the flood plain and its present uses were mapped, changes in number and type of structure were estimated, and representative citizens and public officials were interviewed. The data revealed persistent human invasion of flood plains. The causes for the invasion are assessed, and implications for public policy are discussed.

251. _____, Human Adjustment to Floods: A Geographical Approach to the Flood Problem in the United States. University of Chicago Department of Geography Research Paper No. 29, Chicago: 1945, 225pp.

A discussion of national flood policy at time of writing and its historical development; the major factors affecting adjustment to floods; costs and benefits accruing to each class of possible adjustment, including intangibles and non-flood related costs and benefits; a critique of the use of cost-benefit analysis in flood management decisions; and implications for public policy.

HAIL

252. Chagnon, Stanley A. Jr., "Economic Losses from Hail in the United States." To be published in the October, 1972 issue of Journal of Applied Meteorology. See also, "Crop-Hail intensities in Central and Northwest United States," by Stanley A. Chagnon and Glenn E. Stout. Journal of Applied Meteorology 6, (1967), 542, 548.

Crop-hail insurance data is used to examine: 1) the spatial variations in hail losses across the United States, 2) the temporal variation in loss, 3) daily loss statistics, 4) the relative rank of hail loss compared to losses from other weather extremes, and 5) national economic losses from hail.

253. Lemons, Hoyt, "Hail in American Agriculture." Economic Geography 18, (1942), 363-378.

A general review of crop damage from hail, with emphasis on the distribution of hail and hail damage in the United States.

254. Schleusener, Richard A., "Hailfall Damage Suppression by Cloud Seedings -- A Review of the Evidence." Journal of Applied Meteorology 7, (1968), 1004-1011.

Evaluation of research suggests that seeding at rates less than 1,000 gm hr⁻¹ per storm may increase the number of hail events but that heavier seeding is effective in reducing hailfall damage by reducing total energy impact from hail.

255. United States Department of Agriculture, Economic Research Service, Economic Considerations in Crop Insurance. Washington, D.C.: 1970, 87pp.

This report describes the present use of insurance in terms of coverage, premiums paid, and indemnities, and discusses the differences between crop-hail and all-risk insurance. Concepts of crop yield variability, the sources of variability, and the impact of production technology are discussed. Analyses are made of the relation of coverage to indemnities and premiums on individual farm contracts. The report discusses the problems of adverse insurance risks, and illustrates the use of normal distribution theory and statistical procedures in projecting probable indemnities. It analyzes the influence of the level of yield guarantee and the shape of the yield distribution on probable indemnities. The question of the financial reserves that may be needed by the insurer is examined.

LANDSLIDE

256. Highway Research Board, Committee on Landslide Investigations, Landslides and Engineering Practice, edited by Edwin B. Eckel. HRB Special Report 29, NAS-NRC Publication No. 544, National Academy of Sciences, National Research Council, Washington, D.C.: 1958, 232pp.
- Contains ten chapters, including the following:
Economic and Legal Aspects, by Rockwell Smith; Prevention of Landslides, by Arthur W. Root; and Control and Correction, by Robert F. Baker and Harry E. Marshall.

257. Leighton, F. Beach, "Landslides." In: Geologic Hazards and Public Problems: Conference Proceedings, edited by Robert A. Olson and Mildred M. Wallace. Office of Emergency Preparedness, Region Seven, Santa Rosa, California: 1969, 97-132.

Describes the types and causes of mass land movement and describes adjustments that can be taken to prevent them or to avoid unstable sites.

258. Parks, John George Michael, Awareness of and Adjustment to A Natural Hazard: Sensitive Clays in the Ottawa-Hull Region. Master's thesis, University of Western Ontario, London, Canada: 1971, 159pp.

An analysis of hazard perception and adjustment by national, provincial, and municipal government; engineering firms, construction companies and insurance companies; and individuals toward the sensitive clay hazard, by means of interview and questionnaire. Governmental agencies were asked whether or not they recognized the hazard, which agencies they considered responsible, whether or not they had zoning power, knowledge of restrictive building legislation, and what adjustments, if any, were made. Private companies were surveyed for knowledge of hazard, adjustments practiced, costs of adjustments, etc. On the individual level, relationships between awareness and number and type of adjustments, type of residence tenure, number of years respondent expects to be a resident of the area, map reading ability and other characteristics were explored.

259. Sinha, Durganand, "Behaviour in a Catastrophic Situation: A Psychological Study of Reports and Rumours." British Journal of Psychology 43, (1952), 200-209.

After a devastating landslide, rumors were collected by the author and classified as: exaggerating, fabrication, prediction, and religious interpretation. Two experiments were also conducted. The author presented a fact to a person and walked with him until that person repeated it, or some distortion of it, to another. The type of distortion was noted. For the second experimnt, the author falsely stated that a house on a low hill looked crooked, then noted the replies. The respondents all agreed with the author to varying degrees. Other evidence of credulity and perceptual distortion after the disaster are noted.

260. Zaruba, Quido and Vojtech Mencil, Landslides and Their Control. New York: Elsevier, and Prague: Academia, 1969, 205pp.

The major protion of the book is concerned with the geology of landslides, but it includes chapters on corrective measures and prevention of slope failures.

SNOW

261. American Public Works Association, Snow Removal and Ice Control in Urban Areas. Special Report No. 30, 1313 East 60th Street, Chicago, Illinois 60637, 1965, 126pp.

Discusses methods of measuring cost and performance, chain of command, equipment strategy, snow ordinances, hiring private contractors, operations manuals, communications, and public information.

262. Archer, Paula E., The Urban Snow Hazard: A Case Study of the Perception of, Adjustments to, and Wage and Salary Losses Suffered from Snowfall in the City of Toronto During the Winter of 1967-1968. M.A. Research Paper, Department of Geography, University of Toronto: 1970, 43pp.

From 100 interviews taken in 5 different neighborhoods, measures on the perceived urgency of the snow hazard, the amount of money lost by individuals due to the snow hazard, the adjustments made, the rating of the snow removal service, whether the respondent would be willing to pay more taxes or decrease other services in order to improve the snow program, etc., were taken and some correlations were made.

263. Baumann, Duane D. and Clifford Russell, Eds., Urban Snow Hazard: Economic and Social Implications. WRC Research Report No. 37, University of Illinois Water Resources Center, 2535 Hydrosystems Laboratory, Urbana, Illinois 68101, 1971, 149pp.

Includes the following chapters; Conceptual Framework (of adjustments to natural hazards as applied to urban snow), by Clifford Russell; Range of Adjustment, by John Rooney; An Application of the Adjustment Model (to compute optimal adjustment levels), by Clifford Russell; Municipal Snow Hazard Adjustment, by David G. Arey; The Impact of Snowfall on Manufacturing and Retail Activities in Selected Cities in the United States, by Mark Blacksell; and Individual Attitudes and Adjustments to Snow, by Peggy Lentz and Duane Baumann.

264. Foster, L. T., On the Use of Weather Information in Decision Making: The Example of Municipal Managers and the Urban Snow Hazard. M.A. Research Paper, Department of Geography, University of Toronto: 1970, 73pp.

Presents a Bayesian decision model for helping municipal managers make snow control decisions, and seven hypotheses concerning Bayesian versus actual decision making. The second part of the paper reports on actual decision making involving weather information. Informal interviews of municipal decision makers in eight cities of varying snow hazard were used.

265. Hewes, Leslie, "Wheat Failure in Western Nebraska 1931-1954." Annals of the Association of American Geographers 48, (1958), 375-397.

Using crop insurance data and other sources, a statistical summary of principle causes and extent of wheat failure by county for drought, winterkill, hail, and wind was made. An assessment of the effectiveness of summer fallow in reducing damage is presented, and the effectiveness of other farming practices discussed. The author concludes that all the factors which have contributed to the reduction of wheat failure since 1937 are cultural except one -- autumn precipitation. Thus, although wheat yield is subject to a large amount of human control, it is not unreasonable to expect a repetition of the high failures of 1931-1937.

266. Highway Research Board, "Environmental Considerations in Use of Deicing Chemicals." Highway Research Record No. 193, 1967, 42pp.
Contains the following research reports:
The Relationship of Road Salt Applications to Sodium and Chloride Ion Levels in the Soil Bordering Major Highways, by F. E. Hutchinson and B. E. Olson; A Study of Salt Pollution of Soil by Highway Setting, by George A Prior and Paul M. Berthouex; Pollution Aspects Associated with Chemical Deicing, by F. H. Schraufnagel; Groundwater Contamination by Highway Salting, by James M. Weigle; Effect of Sodium Chloride on Grasses for Roadside Use, by Eliot C. Roberts and Edward L. Zybura.
267. _____, Current Practices for Highway Snow and Ice Control. Current Road Problems No. 9-4R, 2101 Constitution Avenue, Washington, D.C.: August, 1962, 33pp.
Covers the following aspects of snow and ice control: organization, annual preliminary preparations, advance warning, equipment, field operations -- snow removal, field operations -- ice control, safety aspects in winter maintenance and special problems on controlled access highways.
268. Lennon, Joseph T. and Fred R. Krellen, "Cost Analysis of Snow and Ice Control Operations." Yearbook of the American Public Works Association, 1967, 158-171.
Considers the costs and benefits of an urban snow removal operations, with expenditure data for the city of New York. Outlines snow removal planning and limiting factors to effective snow removal.
269. Relph, E. C. and S. B. Goodwillie, Annotated Bibliography on Snow and Ice Problems. Natural Hazards Research Working Paper No. 2, University of Toronto: 1968, 14pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.
Contains 126 citations, most referring to the snow problem in Canada.
270. Rooney, J., "The Economic and Social Implications of Snow and Ice." In: Water, Earth and Man, edited by R. J. Chorley, London: Methuen, 1969, 389-401.
A general overview of the economic and social effects of snow and ice, related to snowfall patterns. Snow as a water supply source and the recreation value of snow are briefly discussed. For five levels of disruption, the effects of snow and ice to nine areas of human activities are presented. The relationships between the physical snow environment and disruption are discussed, with information on disruption obtained from newspaper coverage and public records. Maps of snowfall variability and disruption due to snowfall show that the greatest disruption occurs in the areas of greatest snowfall variability, rather than areas of greatest annual snowfall.

271. _____, "The Urban Snow Hazard in the United States: An Appraisal of Disruption." Geographical Review 57, (1967), 538-559.

Sets forth a hierarchy of snow disruptions for various activities, explores the relationship between factors such as depth, wind, and water content and amount of disruption, and discusses perception and attitudes toward the snow hazard.

272. Russo, J.A. Jr., et al., The Operational and Economic Impact of Weather on the Construction Industry of the United States. Travelers Research Center, 250 Constitution Plaza, Hartford, Connecticut 06103, 1965, 100pp.

Assesses the effects of adverse weather, including snow, on segments of the construction industry. Economic losses are assessed for seasonal and intermittent weather effects. The potential reduction of losses through appropriate use of weather information and improved weather forecasts is estimated. The study also recommends educational programs and methods to inform decision makers of weather service products.

TORNADO

273. Adams, David, The Minneapolis Tornadoes, May 6, 1965: Notes on the Warning Process. Research Report No. 16, The Disaster Research Center, Ohio State University, Columbus, Ohio 43210, 1965, 27pp.

A study of the human elements of a particular disaster warning process, placed in the context of previous warning research. Describes the official warning system and an ad hoc system in which citizens phoned tornado citings to a radio station for broadcast. Emphasis is placed upon the recipients' need for confirmation and the necessary of warnings which are unambiguous and consistent with other messages.

274. Form, William H. and Sigmund Nosow, Community in Disaster. New York: Harper and Brothers, 1958, 273pp.

A study of the Flint-Beecher tornado disaster, with emphasis upon individual and organizational response after the impact. Discusses interpersonal behavior, a comparison of three types of rescue groups, role conflict, help among the victims, the relationship between residents and organizations, panic and shock, the state police, the volunteer fire departments, the Salvation Army, the Red Cross, and disaster planning.

275. Minnis, Mhyra S., The Voice of the People in Disaster and After: A Study in Residential Integration. Texas Tech University, Lubbock, Texas, September, 1971. Distributed by National Technical Information Service. U. S. Department of Commerce, 5285 Port Royal Road, Springfield, Virginia 22151, 187pp.

A study of the adjustments of Negroes, Anglos, and Spanish Americans when tornado victims from former segregated neighborhoods were relocated together. The study was based primarily on interview and questionnaire data taken immediately after impact and three and nine months later. Although the focus is on racial adjustment, the study also contains information on the housing decision reached by the victims over time and how they were effected by financial assistance programs and administrative decisions.

276. Moore, Harry Estill, Tornadoes Over Texas: A Study of Waco and San Angelo in Disaster. Austin: University of Texas Press, 1958, 334pp.

After a description of the disaster and the organizational response, the damage caused by the tornado, legal and governmental problems in relief and reconstruction, damage, and losses to families, temporary and permanent housing, the situation of the aged, race differences, donors and donation, the communications systems, and the emotional response and long-term emotional effects of the disaster are described and discussed. The chapters on emotional and perceptual response contain substantial excerpts from interviews of disaster victims.

277. _____, "Some Emotional Concomitants of Disasters." Mental Hygiene 42, (1958), 45-50.

A year after a tornado hit a community causing death, injury and property damage, another tornado approached the area but did not strike, causing widespread property damage. The results of an interview study on emotional reactions to the first event are compared to emotional reactions following the second. Results are presented and briefly discussed.

278. Perry, H. S. and S. E. Perry, The Schoolhouse Disasters: Family and Community as Determinants of the Child's Response to Disaster. Disaster Study No. 11, National Academy of Sciences, National Research Council, Washington, D.C.: 1959, 66pp.

An interview study of two schoolhouse disasters affecting two lower class, rural, Negro communities. The emotional response of the children and how their response was affected by the behavior of other family members, their pre- and post-disaster family roles, and the cultural milieu of the subcommunity were investigated. Also investigated were the attempts of the adult respondents to explain the disaster, which created special problems because the disaster involved Negroes only, and primarily Negro children. Findings are compared to the findings of a prior study in which white, middle class children from an urban community were killed in a theater disaster (see reference No. 279, this bibliography).

279. Perry, S. E., The Child and His Family in Disaster. Disaster Study No. 5, National Academy of Sciences, National Research Council, Washington, D.C.: 1956, 62pp.

A four-day survey of the disaster situation followed by questionnaires to parents of children and interviews with ninety-one parents chosen on the basis of questionnaire response, on the emotional reactions of children two months after a tornado which killed a number of children in a theatre. The child's emotional state after the tornado was investigated in terms of: 1) pre-disaster experiences, 2) the specific disaster experience the child underwent, and 3) the manner in which parents and other significant persons dealt with the disaster in their relations with the child. Preliminary recommendations on dealing with children after a disaster are included.

280. Sims, John H. and Duane D. Baumann, "The Tornado Threat: Coping Styles of the North and South." Science 176, (June 30, 1972), 1386-1392.

After briefly exploring and rejecting alternate explanations of the disproportionately high tornado death rate in the South, the authors present the results of a sentence completion test which indicate that southerners are more fatalistic, have less faith in the efficacy of their own actions and have less trust in society's warning system. It is concluded that psychological factors resulting in failure to take effective action cause higher tornado death rates in the South.

281. United States Department of Commerce, Environmental Science Services Administration, Tornado Preparedness Planning. Washington, D.C.: March, 1968, 28pp.

A "how to do it" booklet for communities that want to develop a tornado preparedness plan.

282. _____, Tornado Safety Rules. Washington, D.C.: January, 1968, 1pp.

283. _____, Tornado Statistics. Washington, D.C.: December, 1966, 3pp.

Contains number of U.S. tornadoes and tornado days by state and by month: average number of tornadoes by state from 1916-1964; and number of tornadoes, tornado days, and resulting deaths and property losses by year, 1916-1965.

284. Wallace, Anthony F. C., Tornado in Worcester: An Exploratory Study of Individual and Community Behavior in an Extreme Situation. Disaster Study No. 9, National Academy of Sciences, National Research Council, Washington, D.C.: 1956, 163pp.

An analysis of human behavior during the Worcester tornado in terms of a spatial model centering around the impact area and a time oriented model containing the categories of steady state, warning, impact, isolation, rescue, rehabilitation, and irreversible change. Response to the disaster was also discussed in terms of four other theoretical frameworks: the disaster syndrome, the counter disaster syndrome, the length of the isolation period, and the cornucopia theory. Contains extensive quotations from interviews with disaster victims.

TROPICAL CYCLONE (hurricane and typhoon)

285. Bates, F. L., C. W. Fogleman, V. J. Parenton, R. H. Pittman, and G. S. Tracy, The Social and Psychological Consequences of a Natural Disaster: A Longitudinal Study of Hurricane Audrey. Disaster Study No. 18, National Academy of Sciences, National Research Council, Washington, D.C.: 1963, 190pp.

A field study conducted over a period of 4 1/2 years from the date of the hurricane, with emphasis on long-term social change. Topics covered include: 1) warning, impact, and rescue, 2) rehabilitation and recovery, 3) role stresses associated with rehabilitation, 4) mental health effects of Hurricane Audrey, 5) social change in response to Hurricane Audrey, 6) Civil defense in Hurricanes Audrey and Carla, and 7) conclusions and recommendations for further research.

286. Black, R. H., The Effects of Hurricane Camille on Industry, Public Utilities and Public Works Operations. URS Research Company, 155 Bovet Road, San Mateo, California 94402, March, 1970, 79pp.

Reports on the results of an interview survey of public utilities, public works and industry on hurricane plans and preparations, emergency action during the hurricane, damage inflicted, and restoration activities.

287. Brouillete, John, A Tornado Warning System: Its Functioning on Palm Sunday in Indiana. University of Ohio Disaster Research Center Research Report No. 15, Ohio State University, Columbus, Ohio 43210, 1966, 38pp.

Describes how information of tornado imminence flowed through certain organizations to the general public and what, if anything, the organizations learned in their experience with an inadequate warning system.

288. Burton, Ian, Robert W. Kates and Rodman E. Snead, The Human Ecology of Coastal Flood Hazard in Megalopolis. University of Chicago Department of Geography Research Paper No. 115, 1969, 196pp.

A field study of 1,302 miles of shore along the Atlantic seaboard but concentrated upon fifteen case study sites was made to determine present and future land use patterns, adjustments toward the hazard by individuals and government and the effectiveness of the adjustments, perception of the hazard, the total range of possible responses to the hazard, human use of the shore, and implications for public policy. Methods used included an aerial photo sample which was compared with two earlier samples to ascertain the extent of coastal development and growth; a survey of government reports for estimates of tidal flood damage and extent of protective works; a mail survey of warning networks to assess their efficiency; a mail survey of coastal zoning and land use controls; a study of the climatology of damaging storms (published separately); and mapping and extensive interviewing at the case study sites.

289. Burton, Ian and Robert W. Kates, "The Flood Plain and the Seashore: A Comparative Analysis of Hazard-zone Occupance." Geographical Review 54, (1964), 366-385.

A comparison of coastal and riverine flood hazard in terms of hydrological features, geomorphic features, role of engineering works in hazard zone occupance, and advantages of the hazard areas for human occupance.

290. Fogleman, C. W. and V. J. Parenton, "Disaster and Aftermath: Selected Aspects of Individual and Group Behavior in Critical Situations." *Social Forces* 38, (1959), 129-135.

Based on a study which included interviews and participant observation for a period of seven months after a hurricane disaster. Helping behavior, emotional response, the emergence of rescue organizations, and community reconstruction are discussed within the framework of the continuity of socio-cultural systems.

291. Hartman, L. M., David Holland, and Marvin Giddings, "Effects of Hurricane Storms on Agriculture." Water Resources Research 5, (June, 1969), 555-561.

Analyzes the effects of hurricane storms on agriculture by: 1) identifying and estimating the relationship between crop yields and rainfall, 2) estimation of potential yield benefits or losses from hurricanes by states, considering crop acreage distribution, yield changes, and prices, and 3) estimation of benefits or losses for specific hurricanes.

292. Howard, R. A., J. E. Matheson, and D. W. North, "The Decision to Seed Hurricanes." Science 176, (June 16, 1972), 1191-1202.

A mathematical analysis of the cost of seeding versus not seeding hurricanes, taking into consideration estimated probabilities of various outcomes and government responsibility cost is presented. Analyses of the benefit or cost resulting from hurricane seeding experimentation are also presented.

293. Islam, M. Aminul, Human adjustment to Cyclone Hazards, A Case Study of Char Jabbar. Natural Hazards Research Working Paper No. 18, University of Toronto: 1971, 34pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302

A study of a primarily agricultural island in Bangladesh which is subject to frequent cyclones. Study was done by means of a site study and 139 interviews. Covers geographic and socio-economic characteristics of the study site, perception of storm hazard, human adjustments to coastal flooding, choice of adjustment for the public sector, and some very general conclusions.

294. Mather, John R., Richard T. Field, and Gary Yoshioka, "Storm Damage Hazard Along the Eastern Coast of the United States." Journal of Applied Meteorology 6, (1967), 20-30.

Analyzes the frequency of damaging storms from 1935-1964, and discusses the causes of the increase in damaging storms. Includes a map of relative coastal storm damage hazard for three time periods.

295. Mitchell, James Kenneth, A Selected Bibliography of Coastal Erosion, Protection, and Related Human Activity in North America and the British Isles. Natural Hazards Research Working Paper No. 4, University of Toronto: 1968, 66pp. Available from the Institute of Behavioral Science, University of Colorado, Boulder, Colorado 80302.

Approximately 750 citations divided into three general categories: physical background to coastal erosion, nature and control of coastal erosion, and human dimension of coastal erosion, which are further divided into sub-categories. Includes an appendix on major information sources and a list of major statutes of the U. S. federal government, U.S. state governments, and the British Isles concerning coastal erosion.

296. Moore, Harry Estill, Before the Wind: A Study of the Response to Hurricane Carla. Disaster Study No. 19, National Academy of Sciences, National Research Council, Washington, D.C.: 1963, 164pp.

A detailed field study of five areas hit by Hurricane Carla, chosen for urban-rural and high evacuation level-low evacuation level comparisons. The study focused upon the effectiveness of the warning system; how the decision to evacuate was made; how public shelters were established and how people were allocated to shelters, private homes, and commercial dwellings; how the disaster oriented organizations functioned during the disaster; the problems for agencies in the task of returning evacuees; and a comparison between voluntary and involuntary evacuation.

297. Perdakis, Harry S., "Hurricane-Flood Protection in the United States." Proceedings of the American Society of Civil Engineers, Waterways and Harbours Division 93, (WW1, February, 1967), 1-24.

Reviews the studies undertaken by the Army Corps of Engineers and the Weather Bureau on the engineering aspects and economics of structural measures for hurricanes along the Atlantic Seaboards. Includes tables of proposed protective works by area with maximum record flood and estimated damages, design stage, cost of construction, annual benefits, and benefit-cost ratio.

298. Schneider, David, "Typhoons on Yap." Human Organization 16, (Summer, 1957), 10-15.

An analysis of the adjustments toward and the psychological and social meanings of typhoons to the natives of the Western Caroline Islands, where typhoons are a chronic threat. Presents the hypothesis that any chronic threat will take on widespread social meanings beyond its inherent nature.

299. Spillius, James, "Natural Disaster and Political Crisis in a Polynesian Society." Human Relations 10, (1957), 3-27; 113-125.

Although the focus of the article is the developing role of the anthropologist as a social, political and linguistic interpreter in a crisis situation, the social and political reactions of a Polynesian society to a hurricane followed by famine, acute political crisis, and a second hurricane are described.

300. Sugg, Arnold E., "Beneficial Aspects of the Tropical Cyclone." Journal of Applied Meteorology 6, (1968), 39-45.

Discusses the drought breaking effects of some tropical cyclones and tabulates which cyclones have been most beneficial in this respect.

301. _____, "Economic Aspects of Hurricanes." Monthly Weather Review 95, (March, 1967), 143-146.

Total costs of protective measures against hurricanes in some areas are estimated and compared with damage reports from a few recent hurricanes. Costs, savings and damage figures vary with storm intensities and forecast accuracies.

302. United States Army Corps of Engineers, Shore Protection Guidelines. Washington, D.C.: 1971, 59pp.

A general work, intended for the individual property owner considering various types of sand erosion or hurricane protection. A description of wave action and sand transport, man-made effects on the shore and the protective action of dunes, bulkheads, seawalls, revetments, breakwaters, groins, and jetties are discussed. Blueprints of structural measures and cost estimates of various adjustments are included.

303. United States Department of Commerce, Environmental Science Services Administration, Some Devastating Hurricanes of the 20th Century. Washington, D.C.: 1970, 9pp.

Contains maps and data on approximately fifty severe United States hurricanes from 1900-1969 including date, area, wind speed, deaths, and damage.

304. _____, Hurricane. Washington, D.C.: 1969, 39pp.

Contains an explanation of the cause, behavior, and death of hurricanes, the damage which can be caused by hurricanes, the ESSA hurricane warning service, what communities and individuals can do to protect against hurricanes, ESSA programs of research in hurricane control, and a short hurricane bibliography.

305. United States Department of Commerce, National Oceanic and Atmospheric Administration, The Homeport Story: An Imaginary City Gets Ready for a Hurricane. Washington, D.C.: 1971, 20pp.

Presents a sample community hurricane preparedness plan.

TSUNAMI

306. Anderson, William A., "Tsunami Warning in Crescent City, California, and Hilo, Hawaii." In: The Great Alaska Earthquake of 1964: Human Ecology. National Academy of Sciences, National Research Council, Committee on the Alaska Earthquake, Washington, D.C.: 1970, 116-124.

Compares a total of four tsunami warnings, the first resulting in a disaster and the second in slight wave damage, for both communities. Focuses upon the decision-making role of the local official and the warning system he has to work with.

307. Lachman, Roy, Maurice Tatsuoka, William J. Bonk, "Human Behavior During the Tsunami of May 1960." Science 133, (May 5, 1961), 1405-1409.

After a tsunami for which warning was given, but not heeded by large numbers of people, interviews of both evacuees and non-evacuees were conducted. The principal finding was that the warning siren was incorrectly interpreted by the majority of non-evacuees. Socio-economic data on the two groups and prior disaster experience were also investigated as possible determinants of response.

308. Reese, Lymon C. and Hudson Matlock, "Structural Damage from Tsunami at Hilo, Hawaii." Proceedings of the American Society of Civil Engineers, Hydraulics Division 94 (HY4, 1968), 961-982.

Describes and analyzes structural damage. A series of case studies revealed that all light frame buildings and most heavy timber structures were destroyed, with structural steel and reinforced concrete undergoing varying degrees of damage. Damage was particularly severe when front of building was open or glassed, but rear walls were continuous. There was evidence that a strong structure will reduce damage to weaker structures downstream.

309. United States Army Corps of Engineers, The Tsunami of the Alaskan Earthquake, 1964: Engineering Evaluation, by Basil W. Wilson and Alf Torum. Coastal Engineering Research Center, Technical Memorandum No. 25, 1968, 401pp.

After an evaluation of the mechanism of tsunami generation based on field investigation and previous literature, detailed studies of the main tsunami and local seismic waves are given for damaged areas in Alaska, Canada, Washington, Oregon, and California, including engineering evaluations for severely damaged areas. Conclusions are presented for earthquake and tsunami generation characteristics, tsunami propagation characteristics, features of tsunami damage, and general design criteria for tsunami protection.

310. United States Department of Commerce, Environmental Science Services Administration, Tsunami Watch and Warning. Washington, D.C.: 1968, 2pp.

Explains the difference between a tsunami watch and warning, and lists tsunami safety rules.

311. Wiegel, Robert L., "Seismic Sea Waves." In: Geologic Hazards and Public Problems: Conference Proceedings, edited by Robert A. Olson and Mildred M. Wallace. Office of Emergency Preparedness, Region Seven, Santa Rosa, California: 1969, 53-75.

Describes types of damage that occur from tsunamis and discusses the relationship between earthquakes and tsunamis. Charts some relationships between earthquake characteristics and tsunamis, the average annual frequency per year of tsunamis of a given wave height, and the probability of a maximum wave height exceeding a given value in a given duration at Crescent City, California. Briefly discusses the wave dynamics of tsunamis and the phenomenon of locally generated tsunamis.

VOLCANIC ERUPTION

312. Bullard, Fred M., Volcanoes in History, in Theory, in Eruption. Austin: University of Texas Press, 1962, 441pp.

Divided into three sections: Facts and Fiction about Volcanoes, Types of Volcanic Eruptions, and Theory, Cycles and Utilization of Volcanoes.

313. Carroll, John J. and Salvador A Parco, Social Organization in a Crisis Situation: The Taal Disaster. Philippine Sociological Society, Manila: 1966, 59pp.

A field study of a volcano eruption in the Philippines focusing upon immediate reactions to the disaster, patterns of seeking and receiving aid, leadership, evacuation, and an evaluation of the relief effort.

314. Crandell, Dwight R. and Howard H. Waldron, "Volcanic Hazards in the Cascade Range." In: Geologic Hazards and Public Problems: Conference Proceedings, edited by Robert A. Olson and Mildred M. Wallace. Office of Emergency Preparedness, Region Seven, Sanata Rosa, California: 1969, 5-18.

Discusses lava flows, volcanic ash eruption, avalanches of ash and rock debris, floods, and mudflows and their potential danger from several dormant volcanoes in the Cascade Range. Concludes with suggestions for reducing volcanic hazard.

315. Furneaux, Rupert, Krakatoa. Englewood Cliffs, New Jersey: Prentice Hall, 1964, 224pp.

A journalistic account of the event.

316. Keesing, Felix M., "The Papuan Orokaiva Vs. Mt. Lamington: Cultural Shock and Aftermath." Human Organization 11, (Spring, 1952), 16-22.

Describes the reactions of a native population of New Guinea to a volcanic eruption which necessitated extensive resettlement, in the context of their cultural traditions and prior relationships with the mission and the government, which was the principal relief agency. The government had the decision of whether or not to take advantage of the social disorganization in order to build larger permanent settlements in place of the traditional pattern of small groups engaged in shifting agriculture, and to institute other social changes. The author discusses the social ramifications of the plan and concludes that it is unworkable.

317. Lachman, Roy and William J. Bonk, "Behavior and Beliefs During the Recent Volcanic Eruption at Kapocho, Hawaii." Science 131, (1960), 1095-1096.

After a volcanic eruption in which attempts to divert lava flows by earthen dikes had failed, there were widespread offerings to the Hawaiian Volcano Goddess, a practice not limited to one religious creed, ethnic group, age level, or degree of educational achievement. This is attributed to the magnificence of the hazard and the failure of technology.

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